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566.36161CX1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: S. SAMESHIMA, et al

Serial No.: 09/459,342

Filed: December 13, 1999

For: METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED
INFORMATION

Group: 3624

Examiner: E. Colbert

RECEIVED
JUL 06 2004
GROUP 3600

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

June 30, 2004

The following is in response to the Examiner's request for copies of the papers filed on May 21, 2003 some of which apparently were not entered by the January 8, 2004 Decision on Petition.

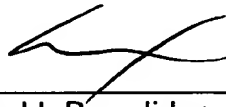
As per a telephone interview held with Examiner Colbert on June 29, 2004, attached herewith are copies of the Petition for Revival, Notice of Appeal, Petition for Extension Time, Amendment After Final and Submission of Substitute Specification and a marked-up copy of the specification as filed in the United States Patent and Trademark Office on May 21, 2003. Also, attached is a copy of the Postcard Receipt indicating the filing of such papers in the Mailroom of the United States Patent and Trademark Office on May 21, 2003. Examiner Colbert is respectfully requested to enter the attached papers and examine the application based therein.

During the telephone interview with Examiner Colbert, it was noted that the United States Patent and Trademark Office records do not show that the above noted Notice of Appeal, Petition for Extension of Time, Amendment After Final and Submission of Substitute Specification were ever entered. As such a response could not be prepared by Examiner Colbert in a timely manner. Accordingly, it was agreed that a communication will be issued from Examiner Colbert resetting the period for response to begin from the date of mailing of the communication. Applicants await the communication and examination of the application based on the attached papers.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (566.36161CX1)

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP



Carl I. Brundidge
Registration No. 29,621

CIB/jdc
(703) 312-6600

Patent Dkt. No. 566.36 F61CX1 Attorney Initials (CIB)

Application No. 09/459,342 Filing Date December 13, 1999

Applicant(s) SAMESHIMA, et al

Papers Filed Herewith on May 21, 2003

COPY

Receipt is hereby acknowledged of the papers filed as indicated by the checked items in connection with the above-identified application:

- ☐ New Application Transmittal Form ☒ Credit Card Payment Form
____ Pages of Specification (____ claims) Fees \$ 2550.00
____ Sheets of Drawings ☒ Amendment /After final
☐ Declaration (____ pages) ☐ Response to Office Action
☐ Fee Transmittal Form ☒ Petition for Extension of Time (____ 3 mos.)
☐ Claim for Priority ☐ Information Disclosure Statement
☐ Priority Documents ☐ PTO-1449 ☐ Copies of References
☐ Assignment Papers ☐ Revised Drawings (____ sheets)
☐ Issue Fee Transmittal ☒ Notice of Appeal
☒ Other Petition for Revival of Application untentionally,

Proposed Drawing Corrections, Substitute Specification
with Marked-up copy

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137(b)

Docket Number (Optional)

566.36161CX1

First named inventor: SAMESHIMA, et al

Application No.: 09/459,342

Filed: December 13, 1999

Title: METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED INFORMATION

Art Unit: 3624

Examiner: E. Colbert

Attention: Office of Petitions
Mail Stop Petition
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450
 FAX: (703) 308-6916

NOTE: If information or assistance is needed in completing this form, please contact Petitions Information at (703) 305-9282.

The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the Office notice or action plus an extensions of time actually obtained.

APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION

NOTE: A grantable petition requires the following items:

- (1) Petition fee;
- (2) Reply and/or issue fee;
- (3) Terminal disclaimer with disclaimer fee --required for all utility and plant applications filed before June 8, 1995; and for all design applications; and
- (4) Statement that the entire delay was unintentional.

1. Petition fee

☐ Small entity-fee \$ _____ (37 CFR 1.17(m)). Applicant claims small entity status. See 37 CFR 1.27.

☒ Other than small entity - fee \$ 1300 (37 CFR 1.17(m))

2. Reply and/or fee

A. The reply and/or fee to the above-noted Office action in _____ Time, Proposed Drawing, the form of Amendment, Petition for Extension of _____ (identify type of reply): Notice of Appeal
☐ has been filed previously on _____
☒ is enclosed herewith. _____ Substitute Specification

B. The issue fee of \$ _____

☐ has been paid previously on _____
☐ is enclosed herewith.

[Page 1 of 2]

This collection of information is required by 37 CFR 1.137. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

3. Terminal disclaimer with disclaimer fee

- ☐ Since this utility/plant application was filed on or after June 8, 1995, no terminal disclaimer is required.
- ☐ A terminal disclaimer (and disclaimer fee (37 CFR 1.20(d)) of \$ _____ for a small entity or \$ _____ for other than a small entity) disclaiming the required period of time is enclosed herewith (see PTO/SB/63).

4. STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(b) was unintentional. [NOTE. The United States Patent and Trademark Office may require additional information if there is a question as to whether either the abandonment or the delay in filing a petition under 37 CFR 1.137(b) was unintentional (MPEP 711.03(c), subsections (III)(C) and (D))].

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

May 21, 2003

Date

Telephone
Number:

703 312-6600

Signature

Carl I. Brundidge, Reg. No. 27,121

Typed or printed name

Antonelli, Terry, Stout & Kraus, LLP
1300 North 17th Street - Suite 1800

Address

Arlington, VA 22209

Address

Enclosures: ☒ Fee Payment

☒ Reply / Amendment, Petition for Extension of Time, Notice of Appeal,
Proposed Drawing Corrections, Substitute Specification

☐ Terminal Disclaimer Form

☐ Additional sheets containing statements establishing unintentional delay

☒ Other: Credit Card Payment Form

CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR 1.8(a)]

I hereby certify that this correspondence is being:

☐ deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: **Mail Stop Petition**, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

☐ transmitted by facsimile on the date shown below to the United States Patent and Trademark Office at (703) 308-6916.

Date

Signature

Type or printed name of person signing certificate

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: SAMESHIMA, et al

Serial No.: 09/459,342

Filed: December 13, 1999

For: METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED
INFORMATION

Group: 3624

Examiner: E. Colbert



COPY

NOTICE OF APPEALCommissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 21, 2003

Sir:

Applicants hereby appeal to the Board of Appeals from the final decision dated October 21, 2002 of the Primary Examiner, finally rejecting claims 11, 14, 17-20, 22, 23, 27 and 29-38. The items below are appropriate:

**An Amendment After Final, Petition for Revival
Unintentionally under 37 CFR 1.137(a) and Petition for
Extension of Time were filed on May 21, 2003.**

The fee of \$320.00 for this Notice is also submitted.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case No. 566.36161CX1).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

Carl I. Brundidge
Registration No. 29,621CIB/jdc
703/312-6600

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GROUP 3600

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: SAMESHIMA, et al

Serial No.: 09/459,342

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May 21, 2003
GROUP 3600

PETITION FOR EXTENSION OF TIME

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In the matter of the above-identified application, applicants hereby respectfully petition for an extension of time to permit filing a response within the third month subsequent to expiration of the shortened statutory period set in the outstanding final Office Action dated October 21, 2002, and as a result of the filing of a Notice of Appeal on May 21, 2003. A Credit Card Payment Form authorizing the amount of \$930.00 to cover the required fee for the requested extension of time is attached hereto.

It is respectfully requested that any shortage in the fee be charged to the account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (Case No. 566.36161CX1).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

CIB/jdc
703/312-6600

Carl I. Brundidge
Registration No. 29,621

566.36161CX1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: SAMESHIMA, et al

Serial No.: 09/459,342

Filed: December 13, 1999

For: METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED
INFORMATION

Group: 3624

Examiner: E. Colbert



COPY

AMENDMENT AFTER FINAL - EXPEDITED
PROCEDURE UNDER 37 CFR 1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 21, 2003

Sir:

In response to the Office Action October 21, 2002, please amend the
above-identified application as follows.

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JUL 06 2004
GROUP 3600

IN THE SPECIFICATION

Please amend the Substitute Specification as follows:

IN THE CLAIMS

Claims 1-10 (canceled).

11. (currently amended) An information transmission device for transmitting plural items of pre-stored information via transmission media to a plurality of information destination devices, said information transmission device comprising:

storage means for pre-storing said plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event indicative of representing a change of situation in or related to said plural items of pre-stored information, said event triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying one of said plural items of pre-stored information to be transmitted in response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said plural items of pre-stored information is to be transmitted;

detection means for detecting whether an event corresponding to said pre-stored event information of one stored in said storage means as part of said plural sets of pre-stored data pre-stored in said storage means has occurred; and

transmission means for ~~transmitting, if~~ upon detection of occurrence of said event by said detection means ~~was detected as having occurred,~~ transmitting via said transmission media, one of said plural items of pre-stored information identified by said identification data corresponding to said pre-stored event information of said

~~one of said plural sets of pre-stored data detected by said detection means as having occurred~~ to one of said plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data.

Claim 12 (canceled).

Claim 13 (canceled).

14. (currently amended) The information transmission device as claimed in claim 11, wherein said event is a modification of at least one of said plural items of pre-stored information.

Claim 15 (canceled).

Claim 16 (canceled).

17. (previously amended) The information transmission device as claimed in claim 11, wherein said event is a transmission of data from at least one of said plurality of information destination devices to said information transmission device.

18. (currently amended) The information processing device as claimed in claim 11, wherein said plural items of pre-stored information is information indicative of a current situation of a facility which contains plural parts and performs a

predetermined process, and wherein one of said plurality of information destination devices to which one of said plural items of pre-stored information is transmitted is a controller which uses said one of said plural items of pre-stored information transmitted to control the predetermined process of said facility.

19. (previously added) The information processing device as claimed in claim 11, further comprising:

means for deciding whether said event detected relates to said information handled by said at least one information processing device;

said transmission means, when said event is judged as relating to said information, transmitting said information identified by said identification data.

20. (currently amended) An information transmission method in an information transmission device interconnected via transmission media with a plurality of information destination devices, said information transmission device including storage means for pre-storing plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event which triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying one of said plural items of pre-stored information to be transmitted in response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said

plural items of pre-stored information is to be transmitted, said information transmission method comprising the steps of:

detecting whether an event corresponding to said pre-stored event information of one ~~stored in said storage means as part of~~ said plural sets of pre-stored data pre-stored in said storage means has occurred, said event being indicative of a change of situation in or related to said plural items of information; and

transmitting, ~~if upon detection of occurrence of~~ said event by said ~~detecting step was detected as having occurred~~, via said transmission media, one of said plural items of pre-stored information identified by said identification data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data ~~detected by said detection means as having occurred to~~ one of said plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data.

Claim 21 (canceled).

22. (currently amended) The information transmission method as claimed in claim 20, wherein said event is a transmission of information via said transmission media from at least one of said plurality of information destination devices to said information transmission device and wherein said transmitting step includes a step of transmitting information associated with said one of plural items of pre-stored information to be transmitted.

23. (previously amended) The information transmission method as claimed in claim 20, wherein said event is a modification of at least one of said plural items of information.

Claim 24 (canceled).

Claim 25 (canceled).

Claim 26 (canceled).

27. (currently amended) The information transmission method as claimed in claim 20, wherein said plural items of pre-stored information are information indicative of a current situation of a facility which contains plural parts and performs a predetermined process, and said transmission step includes a step of transmitting said one of plural items of pre-stored information to be transmitted to a controller which controls the predetermined process of said facility.

Claim 28 (canceled).

29. (currently amended) An information transmission device for transmitting plural items of pre-stored information via transmission media to a plurality of information destination devices, said information transmission device comprising:
storage means for pre-storing said plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items

of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event indicative of representing a change of situation, said event triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying one of said plural items of pre-stored information to be transmitted in response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said plural items of pre-stored information is to be transmitted;

detection means for detecting whether an event corresponding to said pre-stored event information of one stored in said storage means as part of said plural sets of pre-stored data pre-stored in said storage means has occurred; and

transmission means for ~~transmitting~~, if upon detection of occurrence of said event by said detection means was detected as having occurred, transmitting via said transmission media, one of said plural items of pre-stored information identified by said identification data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data detected by said detection means as having occurred to one of said plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data,

wherein said event is a modification of at least one of said plural items of information, wherein said transmission means transmits a modified one of said plural items of information.

30. (previously added) The information transmission device as claimed in claim 11, wherein said event elapses at predetermined time intervals.

31. (currently amended) An information transmission method in an information transmission device interconnected via transmission media with a plurality of information destination devices, said information transmission device including storage means for pre-storing plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event which triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying one of said plural items of pre-stored information to be transmitted in response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said plural items of pre-stored information is to be transmitted, said information transmission method comprising the steps of:

detecting whether an event corresponding to said pre-stored event information of one stored in said storage means as part of said plural sets of pre-stored data pre-stored in said storage means has occurred, said event being indicative of a change of situation; and

transmitting, if upon detection of occurrence of said event by said detecting step was detected as having occurred, via said transmission media, one of said plural items of pre-stored information identified by said identification data

corresponding to said pre-stored event information of said one of said plural sets of pre-stored data ~~detected by said detection means as having occurred~~ to one of said plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data,

wherein said event is a modification of at least one of said plural items of pre-stored information-, and

wherein said transmission step includes a step of transmitting a modified one of said plural items of pre-stored information.

32. (currently amended)The information transmission method as claimed in claim 20, wherein said transmission step includes a step of transmitting a modified one of said plural items of pre-stored information.

33. (currently amended)A computer program stored on a storage medium for execution by an information transmission device ~~for causing transmission of~~ plural items of pre-stored information via transmission media to a plurality of information destination devices, each information transmission device including storage means for storing said plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event which triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying information to be transmitted in

response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said plural items of pre-stored information is to be transmitted, wherein said computer program, when executed, causes said information transmission device to perform the steps of:

detecting whether an event corresponding to said pre-stored event ~~information of one stored in said storage means as part of~~ said plural sets of pre-stored data pre-stored in said storage means has occurred, said event being indicative of a change of situation in or related to said plural items of pre-stored information; and

transmitting, if upon detection of occurrence of said event by said ~~detecting step was detected as having occurred~~, via said transmission media, one of said plural items of pre-stored information identified by said identification data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data ~~detected by said detecting step as having occurred~~ to one of said plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data.

34. (currently amended) The computer program product ~~product~~ as claimed in claim 33, wherein said event is a modification of at least one of said plural items of pre-stored information.

35. (currently amended) A computer program stored on a storage medium for execution by an information transmission device for causing transmission of plural items of pre-stored information via transmission media to a plurality of information destination devices, each information transmission device including storage means for pre-storing said plural items of pre-stored information, and plural sets of pre-stored data for respective ones of said plural items of pre-stored information, each one of said plural sets of pre-stored data including pre-stored event information of an event which triggers distribution of said plural items of pre-stored information upon detection, identification data for identifying one of said plural items of pre-stored information to be transmitted in response to detection of occurrence of said event, and transmission destination data indicative of one of said plurality of information destination devices to which a corresponding one of said plural items of pre-stored information is to be transmitted, said computer program, when executed, causes said information transmission device to perform the steps of:

detecting whether an event corresponding to ~~said pre-stored event information of one stored in said storage means as part of said plural sets of pre-stored data pre-stored in said storage means~~ has occurred, said event being indicative of a change of situation, and

transmitting, ~~if upon detection of occurrence of said event by said detecting step was detected as having occurred~~, via said transmission media, one of said plural items of pre-stored information identified by said identification data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data ~~detected by said detecting step as having occurred~~ to one of said

plurality of information destination devices that is designated by said transmission destination data corresponding to said pre-stored event information of said one of said plural sets of pre-stored data,

wherein said event is a modification of at least one of said plural items of pre-stored information, and

wherein said transmitting step includes a step of transmitting a modified one of said plural items of pre-stored information.

36. (currently amended) The program product as claimed in claim 33, wherein said transmitting step includes a process of transmitting a modified one of said plural items of pre-stored information.

37. (currently amended) The computer program as claimed in claim 33, wherein said plural items of pre-stored information are information indicative of a current situation of a facility which contains plural parts and performs a predetermined process, and one of said plurality of information destination devices to which one of said plural items of pre-stored information is transmitted is a controller which controls the predetermined process of said facility.

38. (previously amended) The computer program as claimed in claim 33, wherein said event elapses at predetermined time intervals.

REMARKS

The present Amendment amends claims 11, 14, 18, 20, 22, 27, 29 and 31-37 and leaves claims 17, 19, 30 and 38 unchanged. Therefore, the present application has pending claims 11, 14, 17-20, 22, 23, 27 and 29-38.

In paragraph 3 of the Office Action, the Examiner indicates that the Proposed Drawing Corrections filed on July 31, 2002 have not been entered due to other minor informalities noted by the Examiner in paragraph 7 of the Office Action. These minor informalities noted by the Examiner in paragraph 7 of the Office Action have been reviewed. However, it appears that the objections are rendered moot.

For example, the Examiner objects that Step 611 is missing from Fig. 9 and Step 1026 is missing from Fig. 13. With respect to Fig. 9 there is no Step 611. The specification, particularly as reflected in the Substitute Specification filed on even date herewith, refers to an event 1611 as illustrated in Fig. 9. Therefore, the Substitute Specification filed on even date herewith corresponds to the content of Fig. 9.

The same can be said with respect to Fig. 13. There is no Step 1026. The Substitute Specification describes a step 1016 which is illustrated in Fig. 13. Therefore, the Substitute Specification filed on even date herewith corresponds to the content of Fig. 13.

In paragraph 7 of the Office Action the Examiner again alleges that Step 1321 is missing from Fig. 16. The July 31, 2002 Proposed Drawing Correction added the reference numeral 1321 to Fig. 16. Filed on even date herewith is another Proposed Drawing Correction in which reference numeral 1321 is clearly set forth in Fig. 16.

The Examiner is respectfully requested to enter the Proposed Drawing Corrections filed on even date herewith.

Therefore, as is quite clear from the above, the objections to the informalities in the drawings is overcome and should be withdrawn.

In paragraph 4 of the Office Action the Examiner indicates that the Substitute Specification filed on July 31, 2002 has not been entered due to minor informalities noted by the Examiner in paragraph 6 of the Office Action. The Substitute Specification filed on July 31, 2002 was again reviewed and modified to address the informalities noted by the Examiner in paragraph 6 of the Office Action and other informalities discovered upon review. These corrections are set forth in a new Substitute Specification filed on even date herewith. A marked-up copy of the previously filed Substitute Specification indicating the amendments made thereto is also attached. Applicants submit that the new Substitute Specification filed on even date herewith does not enter any new matter into the specification. Therefore, entry of the new Substitute Specification filed on even date herewith is respectfully requested.

In paragraph 9 of the Office Action the Examiner rejected claims 11, 14, 17-20, 22, 23, 27 and 29-38 under 35 USC §103(a) as being unpatentable over Pocock (U.S. Patent No. 5,953,046). This rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now recited in claims 11, 14, 17-20, 22, 23, 27 and 29-38 are not taught or suggested by Pocock whether taken individually or in combination with any of the other references of record.

Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

In the Office Action, particularly the section beginning on page 7 entitled "Response to Arguments", the Examiner sets forth two paragraphs in an attempt to respond to the arguments as set forth in the Remarks of the July 31, 2002 Amendment, said Remarks being incorporated herein by reference. In these paragraphs the Examiner alleges that the claims do not clearly recite features argued in the Remarks of the July 31, 2002 Amendment as not being taught or suggested by Pocock. Specifically, the Examiner alleges that the claims do not recite language regarding "prestored information" and that "the information is prestored regarding a particular event which is to trigger the distribution of plural items of information". The Examiner further notes that "although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims".

Therefore, based on the above, amendments were made to the claims to clarify that the plural items of information are prestored in the storage means along with plural sets of data thereby permitting the subsequent use of such plural items of prestored information and plural sets of prestored data. Further, amendments were made to the claims to clarify that the plural sets of prestored data includes prestored event information of an event which triggers distribution of the plural items of prestored information upon detection. These features now more clearly recited in the claims are not taught or suggested by any of the references of record particularly Pocock whether taken individually or in combination with each other.

Thus, according to the present invention the claims now more clearly recite that the detecting means or detecting step is provided so as to detect whether an event corresponding to prestored event information has occurred, wherein the prestored event information represents an event which triggers distribution of the plural items of prestored information upon detection.

Further, according to the present invention the claims now more clearly recite that the transmission means or transmitting step is provided for, upon detecting of occurrence of an event that corresponds to the prestored event information, transmitting one of the plural items of prestored information identified by identification data corresponding to the prestored event information to one of a plurality of information destination devices designated by prestored transmission data.

The above described features of the present invention now more clearly recited in the claims are not taught or suggested by Pocock.

As noted in the July 31, 2002 Amendment, Pocock teaches a television system which allows for a plurality of presentations to be concurrently broadcast for viewing by many users over a single channel of a television distribution system. According to Pocock, when video programs and still frame interactive video services are distributed to a viewer on a single channel, the user terminal receiving the transmitted signal is selectively operable to display one of the video programs or still frame interactive video services. Pocock discloses that when the still frame interactive video services are requested by the viewer, video data specified by an ID input by the viewer is retrieved by the video storage for distribution. The ID input by the viewer is an ID of the viewer and as such is used to determine the destination of

the requested still frame interactive video services. Thus, according to Pocock, a viewer merely issues a request for receipt of still frame interactive services. Such features clearly do not anticipate or render obvious the features of the present invention as now recited in the claims.

Therefore, Pocock fails to teach or suggest storage means for prestoring plural items of prestored information and plural sets of prestored data for respective ones of the plural items of prestored information, wherein each of the plural sets of prestored data includes prestored event information of an event representing a change of situation in or related to the plural items of prestored information, wherein the event triggers distribution of the plural items of prestored information upon detection as recited in the claims.

Further, Pocock fails to teach or suggest detection means (step) for detecting whether an event corresponding to prestored event information of one of the plural sets of prestored data prestored in the storage means has occurred as recited in the claims.

Still further, Pocock fails to teach or suggest transmission means (step) for, upon detection of occurrence of an event by the detection means (step), transmitting via the transmission media, one of the plural items of prestored information identified by the identification data corresponding to the prestored event information of the one of the plural sets of prestored data to one of the plurality of information transmission destination devices that is designated by the transmission destination data corresponding to the prestored event information of the one of the plural sets of prestored data as recited in the claims.

Therefore, based on the above, Applicants submit that the features of the present invention as recited in the claims are not taught or suggested by Pocock whether taken individually or in combination with any of the other references of record. Accordingly, reconsideration and withdrawal of the above described rejection of the claims under 35 USC §103(a) as being unpatentable over Pocock is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the reference utilized in the rejection of claims 11, 14, 17-20, 22, 23, 27 and 29-38.

In view of the foregoing amendments and remarks, Applicants submit that claims 11, 14, 17-20, 22, 23, 27 and 29-38 are in condition for allowance. Accordingly, early allowance of claims 11, 14, 17-20, 22, 23, 27 and 29-38 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (566.36161CX1).

Respectfully submitted,
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INFORMATION

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COPY

SUBMISSION OF SUBSTITUTE SPECIFICATIONCommissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 21, 2003

Sir:

Attached please find a substitute specification for the above-referenced application. Please note that the attached substitute specification does not contain any new matter. Also attached is a marked-up copy of the specification as originally filed.

It is respectfully requested that any shortage in the fees be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (Case No. 566.36161CX1).

Respectfully submitted,

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SUBSTITUTE SPECIFICATION



METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED INFORMATION

BACKGROUND OF THE INVENTION

COPY

1. Field of the Invention

The present invention relates to a method of collecting/distributing message data or data which are stored in each processing device in a distribution processing system, and particularly to a method and an apparatus for collecting and integrating data which are distributed to and stored in plural processing devices, fabricating the integrated data and then supplying the integrated data to an application program.

2. Description of the Related Art

In a distribution processing system, data which are used by an application program means data which are transmitted as message data or data which are stored in a memory or a disk of the processing device containing the application program (hereinafter referred to as "self processing device") or another processing device. The timing at which the application program starts its processing is set to the time point at which it is notified upon reception of a message from another application program, or the application program itself monitors the time point. That is, according to this system, in response to a request of an application program at a reception side, an application program at a message transmission side collects data requested by the application program at the reception side from a storage medium thereof, arranges data items required by the reception side and then transmits the data items thus arranged while continuing message data, or the application program

at the message transmission side periodically transmits a reference message until the application program at the reception side obtains the required data, thereby collecting the required data by using an access method which is varied in accordance with the storage medium of the data.

5 Further, as a means of extracting and supplying data items requested by an application program, there has been known a data base management system (DBMS) for managing a relational data base (RDB) which is described in "Mastering Middle Ware" of Network Computing (the June issue of 1994) pp. 9-23. This system has a function of specifying a condition to extract the data items required by an
10 application program from a table of RDB in which actual data are stored. According to this method, when an application program requests data, an extraction task of extracting the requested data items is performed, and the extracted data are delivered to the application program. Here, the style of the data to be delivered to the application program is determined by an interface between this system and the
15 application program, and for example it is a text style or an original object style. Therefore, in order to use the extracted data for processing, it is necessary to identify the style of the data returned from the DBMS and to convert the style of the data properly.

The application program obtains data and performs processing on the data at
20 a certain timing. Since requested data are different for every program, this timing and the input data are determined for every program. In accordance with processing performance or capacity, the input data are classified into data which are stored in a memory or a disk, data which are transmitted in a message form, or data of a transfer memory style which has a combination of the above two styles. Here, the
25 transfer memory style is defined as a data style in which a copy of information written

into a memory by a user is automatically transferred to another memory for use.

These data comprise plural data items, and the program extracts some of data items from each of plural storage media and integrates the plural data items thus extracted for use. Further, an event serving as a trigger to collect the data occurs in a processing device, in which the program exists (i.e., self processing device), but, it may frequently occur in another processing device.

According to a conventional technique, unless an application program requests data stored in the self processing device (i.e., the processing device having the application program) or another processing device, the data cannot be obtained.

Further, when data are distributively stored in plural storage media, only a part of the data can be extracted from each storage medium. Therefore, an application program which transmits a message serving as a start timing for the processing, or an application program which performs the processing must detect/notify the timing and collect/integrate the data. For the notification of the timing, the processing of notifying an event is required to be prepared at the event occurrence side and the processing of receiving the event is required to be prepared at the application program side.

Further, the application program is required to detect occurrence of an event by itself through periodic polling or the like. In addition, when the data are collected and integrated, it is necessary for data to be obtained through an access method which is different for every storage medium like a transfer memory or a disk, or for an access to be made to RDB to collect the requested latest data when the occurrence of an event is detected. Alternatively, it is necessary for data to be collected at all times even when some of the data thereof are not necessary, and when some data are needed, the data have to be extracted from the collected data and used. Therefore, the application program must be provided with code for event detection processing

and data collection processing in addition to the processing which is originally required by the application program, so that the number of developing steps of the application program is increased.

Further, when the performance of the system is tuned or modified, the arrangement of the application programs is varied, or the data storage medium or the data transmission medium is altered. When the application program itself is modified, data items and events which are necessary are altered. In these cases, 'in the conventional technique it is also necessary for the source code of the application program to be reviewed to correct an event detection portion and a data collecting portion other than the main processing portion. When the program at the event transmission side collects/integrates data, a program which transmits an event to be modified must be reviewed, resulting in an increase of the number of steps for the modification.

Still further, there is a case where relational data are collected in response to occurrence of an event for control data in a control system or a case where relational data are collected when an abnormality occurs. A method of collecting data one after another after detection of an event, although relational data are needed at the time the event occurs, has the problem that it has a low real-time performance for data. Particularly when data are obtained from a remote place through plural transmission media, it is further difficult to guarantee the real-time performance due to a communication load and a transmission delay of a transmission path.

Therefore, the present invention has been implemented to solve the above problem, and has an object to provide a distributed information integrating method and apparatus which can arrange data requested by a request side and supply the arranged data to the request side at a timing requested by the request side

irrespective of a location of a processing device in which the data are stored, and also which can make an application program at the request side independent of changes of data storage medium or a transmission medium used for data collection.

5 SUMMARY OF THE INVENTION

In order to attain the above object, a distributed information integrating method according to the present invention comprises the steps of: collecting, by at least one first processing device, data stored in the processing device according to a predetermined collecting condition in response to occurrence of an event serving as
10 a trigger; transmitting the collected data to a second processing device of an original data request side; and integrating the collected data received by the second processing device according to a predetermined integrating condition.

Since all the data which are needed by an application program on the second processing device are arranged and supplied to the second processing device, an
15 application program in the second processing device is not required to instruct itself or another processing device to collect the data. Besides, the data can also be obtained at the time the needed data are not wholly arranged, but partially arranged. Further, the data which are received by the application program have a data type as indicated by the application program, and thus it is unnecessary to pay attention to
20 the storage medium and the data structure of a data source, existence of the processing device in which the data are stored, or the existence of a transmission medium used for the data collection.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Fig. 1 shows a hardware structure of a distribution processing system

according to an embodiment of the present invention;

Fig. 2 shows a software structure of the distribution processing system of the embodiment;

Fig. 3A is a diagram showing a data structure of a data integration

5 management table 233 of the embodiment;

Fig. 3B is a diagram (subsequent diagram) showing the data structure of the data integration management table 233 of the embodiment;

Fig. 4 is a diagram showing a data structure of a data access management table 231 of the embodiment;

10 Fig. 5 is a diagram showing a data structure of an event linking data table 232 of the embodiment;

Figs. 6A and 6B are diagrams showing a data structure of a transmission and reception message of the embodiment;

15 Fig. 7 is a flowchart showing the processing flow of a filtering processing 222 of the embodiment;

Fig. 8A is a flowchart showing the processing flow of data integration processing 224 of the embodiment;

Fig. 8B is a flowchart (subsequent flowchart) showing the processing flow of the data integration processing 224 of the embodiment;

20 Fig. 8C is a flowchart (subsequent flowchart) showing the processing flow of the data integration processing 224 of the embodiment;

Fig. 9 is a diagram showing a data structure of a status control table 234 of the embodiment;

25 Fig. 10 is a flowchart showing the processing flow of a status control processing 225 of the embodiment;

Fig. 11 is a diagram showing an application example when reception of a message is an event;

Fig. 12A is a diagram showing data items contained in a user data unit 712 of a message 831 of the application example;

5 Fig. 12B is a diagram showing set information of a data integration management table 233 of the application example;

Fig. 12C is a diagram showing set information of the event linking data table 232 of processing devices 802, 803 of the application example;

10 Fig. 13 is a diagram showing an example of an event sequence in the application example;

Fig. 14 is a diagram showing an application example when data renewal is an event;

Figs. 15A to 15C are diagrams showing set information of the data integration management table 233 of a processing device 1101 of the application example;

15 Fig. 16 is a diagram showing an application example when data integration processing is used in multi-stages;

Figs. 17A and 17B are diagrams showing set information of the data integration management table 233 and the event linking data table 232 of the application example; and

20 Fig. 18 is a diagram showing an example when integrated data are delivered when a program requests.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments according to the present invention will be described
25 hereunder with reference to the accompanying drawings.

Fig. 1 is a diagram showing the construction of a system to which the present invention is applied.

The system has processing devices 111 to 113 which mutually communicate (transmit/receive) data to one another through a transmission medium 101, and
5 terminals 121 to 123 each having a display, a keyboard, etc. The processing devices 111 to 113 are connected to the terminals 121 to 123, respectively. Here, the terminal has a man/machine interface such as a display, a keyboard, a touch panel or the like, and has a function of controlling an application program to be executed on the processing device through the interface and referring to the output
10 of the program. Each of the processing devices 111 to 113 has a data storage medium such as a main memory, and each of external storage devices 131 to 133 which are connected to the processing devices 111 to 113 respectively has a data storage medium such as a floppy disk, a hard disk or the like. However, the use of the external storage devices is not indispensable, and the processing device having
15 no external is storage device may be used.

In the present invention, the data stored in the processing device are defined as data which are stored in the storage medium inside the processing device or the external storage device. Further, the processing device 111 transmits/receives data to/from the processing device 114 through the transmission medium 102. The
20 processing device 114 is connected to a terminal 124. As described above, the processing device can be connected to plural transmission media, and the data can be also communicated between the processing device 114 and each of the processing devices 112, 113 through the processing device 111.

Fig. 2 is a diagram showing the software structure in the processing devices
25 111 to 114. The application program is a program for executing business processing

by using data stored in the self processing device (i.e., the processing device containing the application program) or another processing device, or by using data in a message which is received through the transmission medium 101, 102. The data access processing 221 is a program for managing an access to the data stored in the self processing device, and it allows a direct data access not through any storage medium such as a memory, an external storage device or a transfer memory. A communication management 223 is a program for managing a communication between programs in the self processing device and managing transmission/reception of a message with another processing device through the transmission medium 101, 102. A data access management table 231 stores the name and the attribute of data stored in the self processing device.

An event linking data table 232 sets the data item value to be obtained for an event and the request side to which the data item value should be transmitted. A data integration management table 233 defines reference sources of respective data to be integrated and the names of the data, and also defines an output option, etc. when the integrated data are delivered to the application programs 211, 121.

Filtering processing 222 is a program for detecting events such as an event based on a periodic timer in the self processing device, an event based on data renewal and an event based on a message received from another processing device, obtaining the data in the self processing device through the data access processing 221 or obtaining the integrated data by referring to the event linking data table 232, the data access management table 231 and the data integration management table 233, and transmitting data obtained through the communication management 223 to another processing device which requests the data or the data integration processing 224 of the self processing device. The data integration processing 224 is

a program for receiving the data which are transmitted from another processing device or the filtering processing 222 of the self processing device, referring to the data integration management table 233 and the data access management table 231 to integrate the data, and then delivering the integrated data to the application

5 programs 211, 212 or the filtering processing 222. A status control table 234 sets conditions to start/end the collection of the data set in the event linking data table 232 and the integration of the data set in the data integration management table 233. Status control processing 225 is a program for detecting an event such as message reception, data renewal or the like, referring to the status control table 10 234 to detect the timing of starting/ending the data collection or the data integration, and activating relational control information of the event linking data table 232 and the data integration management table 233.

Figs. 3A and 3B are diagrams showing the data structure of the data integration management table 233. A set of packed data which are needed by the application program is hereinafter referred to as a "basket". In Fig. 3A, (i) represents the construction of a basket setting table 301. Each record of the basket setting table 301 comprises a basket name 311, a collection event 312, a collection item table index 313, an output option index 314, a status management table index 315 and an activation status 316. The basket name 311 is the name for identifying the basket.

20 The collection event 312 comprises a type and a condition. The type indicates the type of an event to be collected. For example, the type indicates that the event is message reception and a code indicating the content of the message, or indicates that the event is data renewal and the name of a renewed data table, or indicates that the event is based on a periodic timer and a timer interrupting period. The condition indicates a condition when the data are collected in response to the

25

occurrence of an event. For example, when the event is message reception, the condition indicates a condition which is set to the value of the data item in the message. When the event is data renewal, the condition indicates the name of the renewed data item in the data table. When the event is based on the periodic timer, there is no condition. The collection item table index 313 is an index for indicating a storage place of the corresponding collection item table, and the data structure of the collection item table is shown in (ii) of Fig. 3A. The output option index 314 is an index for indicating a storage place of the corresponding output option table, and the data structure of the output option table is shown in (iii) of Fig. 3B. The status management table index 315 is an index for indicating a storage place of the corresponding status management table, and the data structure of the table is shown in (iv) of fig. 3B. The activation status 316 indicates a status as to whether or not the data integration processing is to be performed.

The data structure of the collection item table is shown in (ii) of Fig. 3A. The collection item table defines a data item and a reference source to be collected in response to the occurrence of an event. Each record of the collection item table comprises a basket item name 351, a type (style) 352, a reference source 353 and a condition 354. The basket item name 351 is a data item name which is defined as an item constituting a basket. The type (style) 352 is the type of the corresponding data item, and it discriminates a long integer type, a short integer type and a character type from one another. The reference source. 353 defines a source (origin) from which the data item is obtained, and it comprises a source name and a data item name. The source name is the data name of the reference source. For example when the event is message reception, the source name indicates the content code of the message, the identifier of the processing device and the name of the data table,

the identifier of the processing device and the basket name 311 of a prepared basket or the like. The data item name is the name of the data item whose value is a target to be obtained in the data indicated by the source name. In this embodiment, when the source is located in a specific processing device, the data item name is indicated by the identifier of the processing device and the data name in the processing device. However, the source may be provided with a unique name in the system to indicate the name. The condition 354 indicates a condition when the value of the indicated data item is obtained from the source indicated by the reference source 353, and it is described on the basis of the comparison between the value of the data item of the data indicated by the source name and the value of the data item received by the event indicated by the collection event 312. For example, it is described like [the data item "ID" in the source data is equal to the data item "bar code number" in the reception message] or the like.

The data structure of the table which defines the output option is shown in (iii) of Fig. 3B. This table sets an option which can be selected when the collected data are delivered to the application program. Each record of the table comprises a time out 372, a data reception/delivery method 373, an AND/OR judgment 374 and a data request side 375. The time out 372 indicates a limit time from the time when the processing device detects an event serving as a data collection condition of a basket until the time when all the data are received. The data reception/delivery method 373 indicates an event type or a demand type. In the case of the event type, data are delivered to the program immediately when the data are arranged or there is a time-out. In the case of the demand type, the arranged data are kept stored, and when the program requests, the data thus stored are delivered to the program. The AND/OR judgment 374 indicates an AND type or an OR type. In the case of the AND

type, "the data are arranged" means that the values of all the items constituting a basket are obtained or that there is a time-out. In the case of the OR type, "the data are arranged" means that the value of any item constituting a basket has been obtained, and the newest values which have been already obtained are used for the values of the other constituent items. The data request side 375 indicates the identifier of an application program to which the data are delivered or the filtering processing 222.

The data structure of the status management table is shown in (iv) of Fig. 3B. The status management table shows the collection status of the data item serving as a collection target in conformity with the event identifier. Each record of the status management table comprises an event identifier 391, a buffer index 392, a first event arrival time 393 and a collection judgment map 394.

The event identifier 391 indicates the number of an event when the AND/OR judgment 374 is the AND type, and it is a number for acquiring the synchronization of data transmitted from one or plural processing devices for the event. The buffer index 392 indicates the address of a buffer which is allocated to store items of data constituting a basket for every event identifier 391. The first event arrival time 393 stores the time when the event indicated by the event identifier 391 is detected, or the time when any basket constituting an item corresponding to the event identifier concerned is first received. The first event arrival time 393 is checked to judge whether a predetermined time has elapsed. By using a bit map, the collection judgment map 394 indicates whether the data are obtained for every item constituting the basket. When the value of the basket constituting item is delivered to the application program or the filtering processing 222 and the buffer is released, the record concerned is deleted. On the other hand, when the AND/OR judgment 374 is

the OR type, the number of records of the status management table is equal to only one, and the buffer area indicated by the buffer index 392 is not released after the data are delivered to the program.

Fig. 4 is a diagram showing the data structure of the data access

5 management table 231.

The data access management table 231 is a table indicating what data are managed by the self processing device and what structure is owned by the data. The data managed by the self processing device contain a message data which is transmitted/received to/from another processing device. Each entry of the data
10 access management table 231 comprises a table name 411, a medium 412 and a data structure index 413. The table name 411 indicates the name of the data table. The medium 412 indicates whether the data indicated by the table name 411 is a message, is stored in a main memory or is stored on a disc. The data structure index 413 indicates the memory address of a table which defines the structure of the data
15 concerned. The table defining the data structure comprises a data item 431 and a type 432. The data item 431 indicates the name of the data item constituting the data concerned. The type 432 indicates the type of the data, and it is the same as the type (style) 352.

Fig. 5 is a diagram showing the data structure of the event linking data table
20 232.

The event linking data table 232 is a table for setting data in the self processing device to be collected and transmitted when an event occurs. That is, this table is a set of baskets when the data stored in the self processing device and the baskets prepared in the self processing device serve as a reference source. One line
25 shown in the table corresponds to one record. Each record of the event linking data

table 232 comprises a collection event 451, a response destination 452, a data name 453, a collection data item 454, a collection condition 455 and an activation status 456. The collection event 451 sets an event serving as a trigger for data collection, and has the same content as the collection event 312. The response destination 452 indicates the identifier of a processing device to which the values of the collected data items are transmitted. For example, it indicates the identifier of a processing device to which the data renewal event of the self processing device is required to be notified. The data name 453, the collection data item 454 and the collection condition 455 have the same function as the reference source 353 and the condition 354 as show in (ii) of Fig. 3A. The activation status 456 indicates a status as to whether or not the collection and transmission of data indicated by the corresponding record should be performed. The event linking data table 232 is a set of data for which the self processing device will serve as a reference source, for every collection event and every response destination.

Fig. 6A is a diagram showing the data structure of a message which the communication management 223 transmits/receives between processing devices or in a processing device. The message comprises a message header 711 for communication control, and a user data portion 712 which are referred to by the application program 211, the filtering processing 222 and the data integration processing 224. The message header 711 comprises a control code 721 for communication, a destination identifying code 722, a code 723 for identifying a processing device at the transmission side, and an event identifier 724. The event identifier 724 is a serial number for time-sequentially discriminating the message which is transmitted by the processing device, and it can be expressed by the combination of the identifier of the processing device and the serial number in the

processing device. Even for messages which are issued by the same program of the same processing device, the occurrence order of these messages can be discriminated. As the destination identifying code 722 it is possible to use a content code which is disclosed in Japanese Laid-open Patent Application No. Sho-56-111353, for example. The user data portion 712 comprises plural data items, for example, and contains the value of each data item. The processing device which receives the message refers to the data access management table 231 to obtain the type of each data item and cut out the value of each data value. Further, the communication management 223 may refer to the data access management table 231 to recognize the type of each data item, and convert the byte order of the data item value so that it can be processed in the self processing device.

Fig. 6B is a diagram showing the data structure of the user data portion 712 when data which are collected in association with the event generated by the filtering processing 222 are transmitted to the request side. The collection event type 731 is the same type as the collection event 312 ((i) of Fig. 3A), that is, the same type as the collection event 451 (Fig. 5). The collection event identifier 732 sets the event identifier of the event generating source. For example, when the event is message reception, the event identifier 724 of the received message is set. When the event is based on the periodic timer, the serial number, etc. are set in the self processing device. When the event is data renewal, the serial number, etc. are set in the processing device in which the renewed data are stored. In the processing device which collects the relational data upon reception of a message notifying this data renewal as a trigger, the collection event identifier 723 attached to the renewed data is specified. The response destination 733 is an identifier of a processing device which serves as a data transmission destination. The source name 734 is the data

name of the reference source, and for example, it is the identifier of the processing device, the name of the data table, etc. The collection data item list 735 sets a list of the collected data item names. The collection data 736 sets the value of each data item in correspondence with the data item of the collected data item list 735. The data structure shown in Fig. 6B is an example, and the data structure may, be set so that plural collected data on the same event are collectively transmitted while riding together, or so that the collected data are collectively transmitted to plural response destinations.

The messages which are received by the filtering processing 222 and the data integration processing 224 and are other than the message when the filtering processing 222 transmits the collected data to the response destination, are discriminated from the collection data message on the basis of the message header 711 or the content of the user data portion 712. It may be made to conform with the data format of Fig. 6B. For example, the message in which the event identifier 724 and the collection event identifier 732 have the same content is discriminated as a message serving as a trigger for data collection. Further, the control data or the message which is received from a specific port of the processing device can be discriminated as a specific message by the identifier of the port.

Fig. 7 is a flowchart showing the process flow of the filtering processing 222. The filtering processing 222 waits for occurrence of an event (step 501). In the case of the message reception event, the communication management 223 receives the message to start the filtering processing 222. In the case of the data renewal event in the self processing device, the data access processing 221 or the data integration processing 224 starts the filtering processing 222 to deliver the renewal data. The case where the renewal data are transmitted from the data integration

processing 224 means a case where a data-integrated basket is delivered to the filtering processing 222. In the case of the data renewal event of another processing device, the communication management 223 receives the message containing the renewal data to start the filtering processing 222. Further, the reception of control data transmitted from a measurement device or a sensor which is connected to the self processing device directly or through a transmission medium is also set as occurrence of an event. In the case of the periodic event, a timer interruption occurs by the periodic timer to start the filtering processing 222 (step 551). When the filtering processing 222 detects the event, the type of the occurring event and the appendant data are obtained (step 502). Subsequently, the event linking data table 232 (Fig. 5) is referenced to search whether there is data or a basket which is required to be obtained in association with the occurring event (step 503). That is, the type of the occurring event and the appendant data are checked against the collection condition of the collection event 451 to judge whether there is a record in which both are coincident. Here, the record which is set as a search target is a record in which the activation status 456 is set to an active status. As a result, if no record to be discharged (transmitted) is located (step 504:N), the processing returns to step 501. If the corresponding record is located (step 504:Y), a data item value satisfying the collection condition 455 for the data item 454 of the data indicated by the data name 453 of the record concerned is obtained (step 505). If there is no collection condition 455, the unconditional status is set. When the data are obtained, the data access management table 231 (Fig. 4) is referred to in order to obtain the medium 412 of the corresponding data and the type 432 of the corresponding data item, and then the data access processing 221 is started to obtain the data. When the data thus obtained is a basket, the basket name 311 and the basket item name

351 of the data integration management table 233 (Fig. 3A) are referenced to obtain the type 352 thereof. When there are plural data to be discharged, all the data are obtained in the same manner as described above. Subsequently, transmission data are prepared on the basis of the data thus obtained (step 506). The response destination 452 of the corresponding record is stored in the response destination 733, the data name 453 thereof is stored in the source name 734, and the collection data item 454 thereof is stored in the collection data item list 735. Further, an identifier which is generated by the filtering processing 222 is stored in the event identifier 724.

Finally, the data are transmitted to the data integration processing 224 of the self processing device or another processing device through the communication management 223 (step 507), and the processing returns to step 501.

Figs. 8A, 8B and 8c are flowcharts showing the process flow of the data integration processing 224. The data integration processing 224 waits for arrival of data from the self processing device or another processing device (step 601).

When data or a message is received through the communication management 223 (step 602), it is judged by referring to the data integration management table 233 (Fig.3A) whether there is any basket which requests the received data (step 603).

That is, if the received message is the collection data, the source name 734 thereof

and the data item name of the collection data item list 735 are checked against the reference source 353 of the data integration management table 233 to judge whether there exists any basket for which the received data is set as a basket constituting item. At this time, the type of the collection data 736 is obtained by referring to the type 352 of the basket constituting item. If there is no corresponding basket (step 603: N), it is judged by referring to the data integration management table 233 (Fig.

3A) whether there is any basket for which the received data is set as a collection event (step 621). That is, the collection event type 731 of the received message (and the collection data 736) is checked against the collection event 312 of the table integration management table 233 to judge whether any basket exists which satisfies the collection condition. At this time, the type of the collection data 736 is obtained by referring to the type 432 of the data item 431 corresponding to the data item of the collection data item list 735 of the data name 411 which corresponds to the source name 734 of the data access management table 231 (Fig. 4). When there is a corresponding basket, the setting or renewal of the collection status shown in (ii) of Fig. 8B is performed (step 622), and then the processing returns to step 601. When there is no corresponding basket, the processing immediately returns to step 601. When there is a basket requesting the received data (step 603:Y), the data item which is necessary to the basket concerned is extracted from the reception message (step 604). That is, the value of at least one data item is extracted from the collection data 736. Thereafter, the collection status in the status management table shown in (ii) of Fig. 8B is set or renewed (step 605). In the search operation of the data integration management table 233 of the steps 603 and 621, the search target is limited to baskets in which the active status 316 is set to an active status. Thereafter, the data item value extracted in step 604 is stored into the memory location of the data item value concerned in a buffer area which is indicated by the buffer index 392 of the status management table ((iv) of Fig. 3B) indicated by the status management table index 315 of the basket concerned (step 606).

Next, it is judged whether the constituent items of the basket are arranged (step 607). The collection status of the data is judged by referring to a status management table collection judgment map 394 of the basket concerned. The

condition when the data are arranged is determined by the AND/OR judgment 374 of the table ((iii) of Fig. 3B) which sets the output option of the basket concerned. When the AND/OR judgment 374 is the AND type, the time when all the constituent items are obtained corresponds to the time when the arrangement is made. When the
5 AND/OR judgment 374 is the OR type, the time when any one of the constituent items is obtained corresponds to the time when the arrangement is made. The latest data on the buffer of the constituent items which were previously obtained is used as the other constituent items.

When it is judged that the data are arranged (step 607:Y), the processing
10 shifts to the processing 632 to deliver the data to the request side. If the data are not arranged (step 607:N), the processing returns to step 601. In the processing 632, it is judged by referring to the output option table of the basket concerned whether the data receiving/delivering method 373 is an event type or a demand type (step 608). If the method 373 is the event type (step 608: Y), the data are delivered to the
15 application program indicated by the data request side 375 of the basket concerned or the filtering processing 222 (step 609). If the method 373 is the demand type (step 608: N), the content of the buffer area of the basket concerned which is indicated by the buffer index 392 is stored (retracted) in the queue (step 625). The application program can take out the data from the queue. After the processing of the steps 609
20 and 625, the re-setting of the collection status, that is, the arrangement of the status management table and the buffer as shown in (iii) of Fig. 8B is performed (step 610), and the processing returns to step 601.

The flowchart showing the flow of the setting and renewal processing of the status management table is shown in (ii) of Fig. 8B. The status management

25 table of the basket concerned is searched to judge whether there is a record having

the collection event identifier 732 of the received message (step 641). When the AND/OR judgment 374 of the output option table is an AND type, the output option is searched on the basis of the event identifier 391. When it is an OR type, the output option table has only one record, and thus it is judged on the basis of the event identifier 391 of the record whether the record is the corresponding record. If there is no corresponding record (step 641 :N), the record is added to the table (step 642), the collection event identifier 732 of the received message is added to the event identifier 391 of the record, and the buffer area is kept to set the index thereof to the buffer index 392 (step 643). The time when the event arrives is set to the first event arrival time 393 (step 644). Thereafter, the bit corresponding to the basket item thus obtained in the collection judgment map 394 is set to be already gained (step 645). If there is any corresponding record (step 641: Y), only the processing of step 645 is performed.

The flowchart showing the flow of the processing of arranging the status management table and the buffer is shown in (iii) of Fig. 8B. First, it is judged whether the AND/OR judgment 374 of the output option table of the basket concerned is an AND type or not (step 651). If it is the AND type (step 651 :y), the overall item value of the basket concerned is unnecessary, and thus the buffer area indicated by the buffer index 392 of the status management table is wholly released (step 652), and the content of the record having the corresponding event identifier in the records of the status management table is cleared (step 653). If it is the RO type (step 651 :N), nothing is done.

The flowchart showing the flow of the time-out monitoring processing is shown in (iv) of Fig. 8C. When the program of this processing is periodically started (step 661), it is judged whether all the records of the basket stored in the basket setting

table 301 of the data integration management table 233 are processed (step 662). If there is any non-processed basket (step 662:Y), the pointer is positioned to the records of a next basket (step 663) to judge whether all the records of the status management table of the basket concerned are processed (step 664). If there is any non-processed record (step 664:Y), the pointer is positioned to the next record of the status management table to obtain a current time (step 665), and the current time is compared with the time-out setting 372 of the basket concerned to judge whether the difference between the current time and the first event arrival time 393 has reached a predetermined value or a limit time (time-out) (step 666). When it is time-out (step 666:Y), the data reception/delivery processing 632 of Fig. 8A is executed (step 667), and the processing then returns to step 664. If the record concerned is not time-out (step 666:N), the processing returns to step 664. If all the records of the status management table are processed or the table is cleared (step 664:N), the processing returns to step 662. When the processing of all the baskets is finished (step 662:N), the time-out monitoring processing is finished. The status when the data collection has not been completed due to interruption by another processing device or the like is monitored by the time-out monitoring processing.

Fig. 9 is a diagram showing the data structure of the status control table 234. A line of the table shown in Fig. 1 corresponds to one record. An event 1611 is the same as the collection event 312 (Fig. 3A) and the collection event 451 (Fig. 5). Start/end 1612 indicates whether the event is an event at the start of the distributed information integrating processing or an event at the end of the distributed information integrating processing. A condition frequency 1613 sets the frequency at which the event 1611 is detected to perform the start or the end indicated by the start/end 1612. An event counter 1614 represents the current detection frequency. A

control target 1615 indicates whether a target under the start/end control is a basket or collection data. A control target index 1616 represents a pointer to a record for which the control target is set. If the target is the basket, it indicates the record of the basket setting table 301 (Fig. 3A). If the target is the collection data, it indicates the record of the event linking data table 232 (Fig. 5).

Fig. 10 is a flowchart showing the processing flow of the status control processing 225. The processing waits for reception of an event (step 1701). When the event is received, the type of the event and the appendant data are obtained (step 1702). Next, the status control table 234 (Fig. 9) is searched to judge whether there is any record which is set to be subjected to the status control in response to this event (step 1703). The search is the processing of searching for a record having an event 1611 which satisfies the type of the event and the appendant data. If there is no corresponding record (step 1703:N), the processing returns to step 1701. If there is any corresponding record (step 1703:Y), the event counter 1614 of the record concerned is incremented by 1 to renew the count value (step 1704), and the condition frequency 1613 and the renewed event counter 1614 are compared with each other (step 1705). If both are not equal to each other (the condition is not satisfied) (step 1706:N), the processing returns to step 1703. If the condition is satisfied (step 1706:Y), the active status 316 or the active status 456 of the record which is indicated by the control target 1615 and the control target index 1616 is renewed (step 1707). That is, if the start/end 1612 of the record of the status control table 234 which is currently being processed indicates the start, the active status 316 or the active status 456 of the record which is indicated by the control target index 16,16 is set to the active status. If the start/end 1612 indicates the end, the active status 316 or the active status 456 of the record which is indicated by the control

target index 1616 is set to the non-active state. Finally, the event counter 1614 of the record under processing is reset (step 1708), and the processing returns to step 1703. The start/end of the data collection can be controlled on the basis of the occurrence frequency of the event or the frequency of data collection by the status control processing 225, and the data collection control can be finely performed. For example, 'collection of data such as a device status, etc. is started in synchronization with an abnormal occurrence event, and thus this embodiment is applicable to such a case where information on a status trend under unattended operation is to be obtained.

Next, a case where distributed information is integrated by using the above-described method and construction will be described hereunder.

Fig. 11 is a diagram showing an applied case where the event is message reception. The system comprises processing devices 801, 802 and 803 which are connected to a common transmission medium. On the basis of a message 831 as a trigger event which is broadcasted through the transmission medium, the filtering processing 222 of the processing device 802 collects the data in a table data 821 stored in an external storage device (disc) 811 thereof and the filtering processing 222 of the processing device 803 collects the data in a table data 822 stored in an internal storage device (memory) thereof in order to transmit these data as messages 841 and 842 to the processing device 801, respectively. The data integration processing 224 of the processing device 801 integrates the messages 831, 841 and 842 to prepare the data 843 constituting a basket and deliver the data to the application program 211.

A list of data items contained in the user data portion 712 of the message 831 is shown in (i) of Fig. 12A. The data structure of the table data 821 owned by

the processing device 802 is shown in (ii) of Fig. 1 2A. Each record comprises data items and has a part ID as a key as shown in (ii) of Fig. 1 2A. The data structure of the table data 822 stored by the processing device 803 is shown in (iii) of Fig. 1 2A, and the table data 822 comprises data items 916-919 with the lot number (Lot No.) as a key.

Fig. 12B is a diagram showing an example of the data integration management table 233 of the processing device 801 (S1). The data-integrated basket is defined by a record 921 of a basket setting table 301 and a table linked from the record 921. The basket name is "production instruction". The collection event is limited to events each having a message (Msg) in which the destination discrimination code 722 is "line access" and a condition in which the part ID is larger than 1000. The item to be collected when a message satisfying the collection condition of the collection event is received and when the collection data are received is set in records 941 to 945 of the collection item table. The item values which are defined in the records 941 and 942 are data which are obtained from the reception message serving as the collection event. The item values defined in the records 943 and 944 are the values of data items which are "condition value 1" and "condition value 2" of the table data 821 in "manufacturing condition" of the processing device 802 (S2). The "condition value 1" satisfies such a condition that the part ID of "manufacturing condition" is equal to the part ID of the collection event message, and the "condition value 2" satisfies such a condition that the quality reference value is larger than or equal to the quality reference value of the collection event message in addition to the "condition value 1". Likewise, the item value defined in the record 945 is the value of the data item "lot track record" of the table data 822 "manufacturing track record" of the processing device 803 (S3). The "lot track record"

means the lot track record of records which are contained in the records of the table data 822 and in which "lot number" is equal to the lot number of the collection event message. Each basket constituent item is delivered to a program shown in the data request side 375 (Fig. 3B) in the format of a long integer type or a 6-byte character type as indicated in the field of the type (style).

A setting example of the event linking data table 232 of the processing device S2 is shown in (vi) of Fig. 12C. Records 951 and 952 are obtained by extracting records 943 and 944 on the processing device S2 in the collection item table of the data integrating management table 233, respectively. The collection condition of the collection event is the same collection condition as the collection event of the processing device S1. The response destination of the collected data is the processing device S1 of the request side. (vii) of Fig. 120 shows a setting example of the event linking data table 232 of the processing device 803 (S3). The record 961 is obtained by extracting the record 945 on the processing device 53 in the collection item table of the data integration management table 233.

Fig. 13 is a diagram showing an event sequence in this embodiment, and shows the operation of the processing devices S1, S2 and S3 after the message 831 of the collection event is received. First, when the message 1001 "line access" of the event identifier 1 is passed through the transmission medium, the processing device S1 ensures a data storage area, obtains the data items "part ID" and "lot number" from the message, and then stores them into the data storage area (1011). At the same time, the processing device S2 starts to obtain the data items "condition value 1" and "condition value 2" (1021), and starts to obtain the data item "lot track record" (1031). The processing device S3 finishes obtaining the data (1032), and transmits the data to the processing device S1 (1012). The processing device S1 receives the

data, and stores the data into the data storing area for the event identifier 1 which is ensured in the step 1011. Subsequently, the message 1002 "line access" of the event identifier 2 is passed (1002), and the processing device S1 receiving the message newly ensures the data storage area for the event identifier 2 although the
5 collection processing on the event identifier 1 is not finished (1013).

The processing device S2, S3 start to obtain data with a message 1002 as a trigger (1022, 1033). Subsequently, the processing device S3 finishes the data obtaining processing in association with the event identifier 1 (1023), and transmits the data to the processing device S1. The processing device S1 receives
10 the data (1014). If the AND/OR judgment 374 is specified as the AND type, it judges that the data are arranged, and the data are delivered to the application program 211 (1017). Subsequently, in the same manner as described above, the processing device S1 receives the data (1034) obtained by the processing device S3, stores the data into the ensured data storage area (1015), receives and stores the data (1024)
15 obtained by the processing device S2 (1016), and delivers the data to the application program 211 (1018). When the application program 211 is set to receive the data in the OR type, the value of the latest data item received is delivered to the application program 211 at all the time points 1011 to 1016.

As described above, according to this embodiment, the application program
20 211 can obtain data which are distributively stored in the processing devices S2, S3 at the time the message 831 occurs. The application program 211 can obtain only the values of necessary data items without considering the processing device in which the data are stored and the data structure of the data. Further, only the data which are interlocked with the occurrence of the message 831 are delivered, and
25 thus it is not necessary for all data containing necessary and unnecessary data to be

obtained and for the necessary data to be selectively extracted by judging the contents of all the data. Further, even when the data structure of the data tables 821 and 822 is altered, it is sufficient to merely alter the set value of the table in association with the table access management table 231 and the data integration management table 233, and it is unnecessary to review the source code of the application program 211.

Fig. 14 is a diagram showing an applied case where the data renewal is an event.

The system comprises processing devices 1101 (S1), 1102 (S3) and 1104 (S4) which are connected to a common transmission medium. In response to the renewal of the data table 1111 as a trigger event, the filtering processing 222 of the processing device S3 refers to the event linking data table 232 to transmit the data of the data table 1111 as a message 1121 to the other processing devices S1 and S4. The filtering processing 222 of the processing device S4 receives the message as a data renewing event of the other processing devices, and refers to the event linking data table 232 to collect the relational data from the data table 1112 and transmit a message 1122 to the processing device S1 serving as the response destination.

The data integration processing 224 of the processing device 51 refers to the data integration management table 233 to integrate the received data, and delivers the integrated data to the application program 211. As described above, the relational data can be transmitted to the processing device S1 with the renewal event of the data table 1111 as a trigger. Therefore, the program which renews the data table 1111 is not required to transmit the renewal event to the processing device S1, and also, the application program 211 of the processing device S1 is not required to

monitor the renewal of the data table 1111 and may merely wait for arrival of necessary data, so that it can be devoted to the processing which uses the arriving data.

Fig. 15A is a diagram showing a setting example of the data integration management table 233 of the processing device S1. The data-integrated basket is defined by the record 1211 of the basket setting table 301 and the table linked therefrom. The basket name is "advancement". The collection event is the renewal of the data item "lot track record" in the data table 1111 "manufacturing track record" of the processing device S3. The items to be collected when the collection event and the collection data are received are set in records 1231 to 1233 of the collection item table. The item values defined in the records 1231 and 1232 are data which are obtained from the data items "lot number" and "lot track record" in the data table 1111 "manufacturing track record" of the processing device S3 respectively, and these item values are contained in the message 1121. The item value defined in the record 1233 is the value of the data item "planned quantity" of the data table 1112 "manufacturing plan" of the processing device S4.

Fig. 15B is a diagram showing a setting example of the event linking data table 232 of the processing device S3. The records 1241 and 1242 are obtained by extracting the records 1231 and 1232 on the processing device S3 in the collection item table of the data integration management table 233 respectively. The response destination of the collected data are the processing devices S1 and S4 at the request side. Fig. 150 is a diagram showing a setting example of the event linking data table 232 of the processing device S4. The record 1251 is likewise obtained by extracting the record 1233 on the processing device S4 in the collection item table of the data integration management table 233.

The above embodiments are directed to the applied case where the message is set as an event and the case where the data renewal is set as an event. In the case of the periodic event, the data collection is performed in the same manner. The event linking data table 232 and the data integration management table 233 are set as described above, and data and message data which are stored into plural processing devices can be collected in a composite manner. By setting these tables, the application program 211 is allowed to receive the data. Therefore, it is unnecessary to take the medium or the processing device into account, collect the data while sequentially inquiring about the data and review the programs due to alteration of the data structure of the messages and the data tables, so that the labor required for developments can be greatly reduced. Further, the data are not collected after the event is detected, but upon occurrence of an event the plural processing device sides cooperate with one another to transmit the indicated data, so that the data can be obtained on a real-time basis, and the processing performance can also be enhanced.

Fig. 16 is a diagram showing an applied case where the data integration processing is used in multiple stages. This is the case where the application program 211 on the processing device 1301 (S1) collects the data of the processing devices 1302 (S2) to 1308 (S8). The data on the data table 1314 of the processing device S4 1304 and the data on the data table 1313 of the processing device S3 are transmitted to the processing device S2 1302 on the basis of the messages 1321, 1322 respectively, the value of the data item is also obtained from the data table 1312 of the processing device S2, and these data are integrated by the data integration processing 224 of the processing device S2. Reference numeral 1341 represents the basket obtained by integrating the collected data. The basket 1341 is

transmitted to the filtering processing 222 of the processing device S2, and transmitted as a message 1325 to the processing device S1 which requests this basket. Further, the data on the data table 1317 of the processing device S7 and the data on the data table 1318 of the processing device S8 are periodically transferred to the data table 1316 of the processing device S6 1306 by a transfer memory 1326. The data are transmitted as a message 1328 through the filtering processing 222 of the processing device S6 1306 to the processing device S1, and collected as a basket 1342. The processing device S1 integrates the basket 1341 obtained from the processing device S2 on the basis of the message 1325 and the basket 1342 to prepare a basket 1343, and delivers the basket 1343 to the application program 211. The basket 1343 is prepared on the basis of the baskets 1341 and 1342, and the basket is used in multiple stages inside/outside the processing device. The data of the processing devices S3, S4 and S7, S8 to which the transmission medium is not directly linked may be directly obtained from the processing device S1 if the communication can be performed. However, by using the construction of the above embodiment, the baskets 1341 and 1342 may be collected on the basis of different events to integrate the data as a single basket on the basis of the basket 1343. Further, the information of the processing devices S2 to S4 is collected as a gate way by the processing device S2, thereby localizing the setting of the table integration management table 233 of the processing device S1.

Fig. 17A is a diagram showing a setting example of the data integration management table 233 held by the processing device S1. A record 1411 defines the basket 1343. No collection event is set in this record 1411. That is, as the constituent items, the basket only receives data transmitted from the self processing device or another processing device. The constituent item of the basket 1343 is

defined by the records 1421 and 1422 of the collection item table. That is, the basket 1343 is an integration of the basket 1341 "N2 status" and the basket 1342 "N3 status". The source of the basket "N2 status" is a basket having the name "status basket" of the processing device S2, and the source of the basket "N3 status" is a basket "Net3 status" of the self processing device. The record 1412 defines the basket 1342, that is, the basket "Net3 status". The basket "Net3 status" comprises data to be collected when the data, table 1316 which is called "status table" of the processing device S6 is renewed. The constituent item of the basket "Net3 status" is defined by the record 1431 of the collection item table. That is, it is all the items, of the "status table" of the processing device S6. The type of the constituent item in the records 1421, 1422 and 1431 indicates "structure" which is an assembly of plural data items.

Fig. 17B is a diagram showing a setting example of the event linking data is table 232 which is held by the processing device S2. A record 1441 is set to transmit all the data items to the processing device S1 when the basket 1341 which is named "status basket of the self processing device is renewed. Here, "status basket is the basket 1341 obtained by integrating data which are collected on the basis of an event such as period, renewal or the like from the processing devices S2, S3 and S4, and the details of the constituent item are defined by the data integration management table 233 which is held by the processing device S2.

Some data collection modes and the applied cases where the processing device integrating the collected data immediately delivers baskets to the application program are described above. Fig. 18 is a diagram showing the system construction when the collected and integrated data are delivered at the time the program requests. A processing device 1501 collects and integrates data from a processing

device 1502 and a processing device 1503. The integrated data are used by the application program 211 of the processing device 1504 or the application program 211 of a processing device 1505. Here, the processing device 1501 and the processing device 1504 are connected to transmission media respectively, and the transmission media 1511, 1512 are linked to each other through a processing device serving as a gate way or WAN. The processing device 1505 is linked to the transmission medium 1513 through a communication device 1522, and the processing device 1501 is linked to the transmission medium 1513 through the communication device 1521. This is applied to such cases where the transmission medium 1513 is a public telephone line, the communication devices 1521, 1522 are modems, the transmission medium 1513 is a radio LAN, the communication devices 1521, 1522 are radio LAN interfaces, etc. The processing device 1505 is a portable information terminal or the like. In this case, there is a case where the data integrated in the processing device 1501 cannot be immediately transmitted or a case where it is required that the data are not immediately received for some reason and the results which are afterwards collected as a single of unit are received. In such a case, the data are collected from the processing devices 1502 and 1503 on the basis of the messages 1541 and 1542 as described above and integrated, thereby retracting the integrated data as data 1544 from the buffer. At this time, the data integration management table 233 of the processing device 1501 indicates the demand type as the data reception/delivery method 373 of the collected basket. The retracted data are transmitted 1545 to the processing device 1504 at the convenience of the processing device 1504 or are transmitted 1546 to the processing device 1505 at the convenience of the processing device 1505, and used by the respective application programs 211 thereof.

As described above, according to the present invention, the data which are required by the application program are arranged and supplied to the application program when the application program needs the data. Therefore, the application is not required to be provided with code for inquiring about the data collection, and thus
5 the development of programs can be facilitated. Further, it is unnecessary to correct the application program even when the storage medium and the data structure of the data source, the processing device storing the data and the transmission medium used for the data collection are renewed.

Further, the control is performed on the basis of the occurrence of an event
10 which indicates the start or the end of the data collection, so that the data collection timing can be controlled more finely.

SUBSTITUTE SPECIFICATION

METHOD AND APPARATUS FOR INTEGRATING DISTRIBUTED INFORMATION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of collecting/distributing message data or data which are stored in each processing device in a distribution processing system, and particularly to a method and an apparatus for collecting and integrating data which are distributed to and stored in plural processing devices, fabricating the integrated data and then supplying the integrated data to an application program.

2. Description of the Related Art

In a distribution processing system, data which are used by an application program means data which are transmitted as message data or data which are stored in a memory or a disk of the processing device containing the application program (hereinafter referred to as "self processing device") or another processing device. The timing at which the application program starts its processing is set to the time point at which it is notified upon reception of a message from another application program, or the application program itself monitors the time point. That is, according to this system, in response to a request of an application program at a reception side, an application program at a message transmission side collects data requested by the application program at the reception side from a storage medium thereof, arranges data items required by the reception side and then transmits the data items thus arranged while continuing message data, or the application program

at the message transmission side periodically transmits a reference message until the application program at the reception side obtains the required data, thereby collecting the required data by using an access method which is varied in accordance with the storage medium of the data.

5 Further, as a means of extracting and supplying data items requested by an application program, there has been known a data base management system (DBMS) for managing a relational data base (RDB) which is described in "Mastering Middle Ware" of Network Computing (the June issue of 1994)^{pp 9-23} (p9-23). This system has a function of specifying a condition to extract the data items required by an
10 application program from a table of RDB in which actual data are stored. According to this method, when an application program requests data, an extraction task of extracting the requested data items is performed, and the extracted data are delivered to the application program. Here, the style of the data to be delivered to the application program is determined by an interface between this system and the
15 application program, and for example it is a text style or an original object style. Therefore, in order to use the extracted data for processing, it is necessary to identify the style of the data returned from the DBMS and to convert the style of the data properly.

The application program obtains data and performs processing on the data at
20 a certain timing. Since requested data are different for every program, this timing and the input data are determined for every program. In accordance with processing performance or capacity, the input data are classified into data which are stored in a memory or a disk, data which are transmitted in a message form, or data of a transfer memory style which has a combination of the above two styles. Here, the
25 transfer memory style is defined as a data style in which a copy of information written

into a memory by a user is automatically transferred to another memory for use.

These data comprise plural data items, and the program extracts some of data items from each of plural storage media and integrates the plural data items thus extracted for use. Further, an event serving as a trigger to collect the data occurs in a processing device, in which the program exists (i.e., self processing device), but, it may frequently occur in another processing device.

According to a conventional technique, unless an application program requests data stored in the self processing device (i.e., the processing device having the application program) or another processing device, the data cannot be obtained. Further, when data are distributively stored in plural storage media, only a part of the data can be extracted from each storage medium. Therefore, an application program which transmits a message serving as a start timing for the processing, or an application program which performs the processing must detect/notify the timing and collect/integrate the data. For the notification of the timing, the processing of notifying an event is required to be prepared at the event occurrence side and the processing of receiving the event is required to be prepared at the application program side. Further, the application program is required to detect occurrence of an event by itself through periodic polling or the like. In addition, when the data are collected and integrated, it is necessary for data to be obtained through an access method which is

different for every storage medium like a transfer memory or a disk, or for an access to be made to RDB to collect the requested latest data when the occurrence of an event is detected. Alternatively, it is necessary for data to be collected at all times even when some of the data thereof are not necessary, and when some data are needed, the data have to be extracted from the collected data and used. Therefore, the

application program must be provided with code for event detection processing and data collection processing in addition to the processing which is originally required by the application program, so that the number of developing steps of the application program is increased.

5 Further, when the performance of the system is tuned or modified, the arrangement of the application programs is varied, or the data storage medium or the data transmission medium is altered. When the application program itself is modified, data items and events which are necessary are altered. In these cases, 'in the conventional technique it is also necessary for the source code of the application
10 program to be reviewed to correct an event detection portion and a data collecting portion other than the main processing portion. When the program at the event transmission side collects/integrates data, a program which transmits an event to be modified must be reviewed, resulting in an increase of the number of steps for the modification.

15 Still further, there is a case where relational data are collected in response to occurrence of an event for control data in a control system or a case where relational data are collected when an abnormality occurs. A method of collecting data one after another after detection of an event, although relational data are needed at the time the event occurs, has the problem that it has a low real-time performance for data.

20 Particularly when data are obtained from a remote place through plural transmission media, it is further difficult to guarantee the real-time performance due to a communication load and a transmission delay of a transmission path.

Therefore, the present invention has been implemented to solve the above problem, and has an object to provide a distributed information integrating method
25 and apparatus which can arrange data requested by a request side and supply the

arranged data to the request side at a timing requested by the request side
irrespective of a location of a processing device in which the data are stored, and
also which can make an application program at the request side independent of
changes of data storage medium or a transmission medium used for data collection.

5

SUMMARY OF THE INVENTION

In order to attain the above object, a distributed information integrating
method according to the present invention comprises the steps of: collecting, by at
least one first processing device, data stored in the processing device according to a
10 predetermined collecting condition in response to occurrence of an event serving as
a trigger; transmitting the collected data to a second processing device of an original
data request side; and integrating the collected data received by the second
processing device according to a predetermined integrating condition.

Since all the data which are needed by an application program on the second
15 processing device are arranged and supplied to the second processing device, an
application program in the second processing device is not required to instruct itself
or another processing device to collect the data. Besides, the data can also be
obtained at the time the needed data are not wholly arranged, but partially arranged.
Further, the data which are received by the application program have a data type as
20 indicated by the application program, and thus it is unnecessary to pay attention to
the storage medium and the data structure of a data source, existence of the
processing device in which the data are stored, or the existence of a transmission
medium used for the data collection.

25

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a hardware structure of a distribution processing system according to an embodiment of the present invention;

Fig. 2 shows a software structure of the distribution processing system of the
5 embodiment;

Fig. 3A is a diagram showing a data structure of a data integration management table 233 of the embodiment;

Fig. 3B is a diagram (subsequent diagram) showing the data structure of the data integration management table 233 of the embodiment;

10 Fig. 4 is a diagram showing a data structure of a data access management table 231 of the embodiment;

Fig. 5 is a diagram showing a data structure of an event linking data table 232 of the embodiment;

15 Figs. 6A and 6B are diagrams showing a data structure of a transmission and reception message of the embodiment;

Fig. 7 is a flowchart showing the processing flow of a filtering processing 222 of the embodiment;

Fig. 8A is a flowchart showing the processing flow of data integration processing 224 of the embodiment;

20 Fig. 8B is a flowchart (subsequent flowchart) showing the processing flow of the data integration processing 224 of the embodiment;

Fig. 8C is a flowchart (subsequent flowchart) showing the processing flow of the data integration processing 224 of the embodiment;

25 Fig. 9 is a diagram showing a data structure of a status control table 234 of the embodiment;

Fig. 10 is a flowchart showing the processing flow of a status control processing 225 of the embodiment;

Fig. 11 is a diagram showing an application example when reception of a message is an event;

5 Fig. 12A is a diagram showing data items contained in a user data unit 712 of a message 831 of the application example;

Fig. 12B is a diagram showing set information of a data integration management table 233 of the application example;

10 Fig. 12C is a diagram showing set information of the event linking data table 232 of processing devices 802, 803 of the application example;

Fig. 13 is a diagram showing an example of an event sequence in the application example;

Fig. 14 is a diagram showing an application example when data renewal is an event;

15 Figs. 15A to 15C are diagrams showing set information of the data integration management table 233 of a processing device 1101 of the application example;

Fig. 16 is a diagram showing an application example when data integration processing is used in multi-stages;

20 Figs. 17A and 17B are diagrams showing set information of the data integration management table 233 and the event linking data table 232 of the application example; and

Fig. 18 is a diagram showing an example when integrated data are delivered when a program requests.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments according to the present invention will be described hereunder with reference to the accompanying drawings.

Fig. 1 is a diagram showing the construction of a system to which the
5 present invention is applied.

The system has processing devices 111 to 113 which mutually communicate (transmit/receive) data to one another through a transmission medium 101, and terminals 121 to 123 each having a display, a keyboard, etc. The processing devices 111 to 113 are connected to the terminals 121 to 123, respectively. Here,
10 the terminal has a man/machine interface such as a display, a keyboard, a touch panel or the like, and has a function of controlling an application program to be executed on the processing device through the interface and referring to the output of the program. Each of the processing devices 111 to 113 has a data storage medium such as a main memory, and each of external storage devices 131 to 133
15 which are connected to the processing devices 111 to 113 respectively has a data storage medium such as a floppy disk, a hard disk or the like. However, the use of the external storage devices is not indispensable, and the processing device having no external is storage device may be used.

In the present invention, the data stored in the processing device are defined
20 as data which are stored in the storage medium inside the processing device or the external storage device. Further, the processing device 111 transmits/receives data to/from the processing device 114 through the transmission medium 102. The processing device 114 is connected to a terminal 124. As described above, the processing device can be connected to plural transmission media, and the data can
25 be also communicated between the processing device 114 and each of the

processing devices 112, 113 through the processing device 111.

Fig. 2 is a diagram showing the software structure in the processing devices 111 to 114. The application program is a program for executing business processing by using data stored in the self processing device (i.e., the processing device containing the application program) or another processing device, or by using data in a message which is received through the transmission medium 101, 102. The data access processing 221 is a program for managing an access to the data stored in the self processing device, and it allows a direct data access not through any storage medium such as a memory, an external storage device or a transfer memory. A communication management 223 is a program for managing a communication between programs in the self processing device and managing transmission/reception of a message with another processing device through the transmission medium 101, 102. A data access management table 231 stores the name and the attribute of data stored in the self processing device.

An event linking data table 232 sets the data item value to be obtained for an event and the request side to which the data item value should be transmitted. A data integration management table 233 defines reference sources of respective data to be integrated and the names of the data, and also defines an output option, etc. when the integrated data are delivered to the application programs 211, 121.

Filtering processing 222 is a program for detecting events such as an event based on a periodic timer in the self processing device, an event based on data renewal and an event based on a message received from another processing device, obtaining the data in the self processing device through the data access processing 221 or obtaining the integrated data by referring to the event linking data table 232, the data access management table 231 and the data integration management table

233, and transmitting data obtained through the communication management 223 to another processing device which requests the data or the data integration processing 224 of the self processing device. The data integration processing 224 is a program for receiving the data which are transmitted from another processing device or the filtering processing 222 of the self processing device, referring to the data integration management table 233 and the data access management table 231 to integrate the data, and then delivering the integrated data to the application programs 211, 212 or the filtering processing 222. A status control table 234 sets conditions to start/end the collection of the data set in the event linking data table 232 and the integration of the data set in the data integration management table 233. Status control processing 225 is a program for detecting an event such as message reception, data renewal or the like, referring to the status control table 234 to detect the timing of starting/ending the data collection or the data integration, and activating relational control information of the event linking data table 232 and the data integration management table 233.

Figs. 3A and 3B are diagrams showing the data structure of the data integration management table 233. A set of packed data which are needed by the application program is hereinafter referred to as a "basket". In Fig. 3A, (i) represents the construction of a basket setting table 301. Each record of the basket setting table 301 comprises a basket name 311, a collection event 312, a collection item table index 313, an output option index 314, a status management table index 315 and an activation status 316. The basket name 311 is the name for identifying the basket. The collection event 312 comprises a type and a condition. The type indicates the type of an event to be collected. For example, the type indicates that the event is message reception and a code indicating the content of the message, or indicates

that the event is data renewal and the name of a renewed data table, or indicates that the event is based on a periodic timer and a timer interrupting period. The condition indicates a condition when the data are collected in response to the occurrence of an event. For example, when the event is message reception, the condition indicates a condition which is set to the value of the data item in the message. When the event is data renewal, the condition indicates the name of the renewed data item in the data table. When the event is based on the periodic timer, there is no condition. The collection item table index 313 is an index for indicating a storage place of the corresponding collection item table, and the data structure of the collection item table is shown in (ii) of Fig. 3A. The output option index 314 is an index for indicating a storage place of the corresponding output option table, and the data structure of the output option table is shown in (iii) of Fig. 3B. The status management table index 315 is an index for indicating a storage place of the corresponding status management table, and the data structure of the table is shown in (iv) of fig. 3B. The activation status 316 indicates a status as to whether or not the data integration processing is to be performed.

The data structure of the collection item table is shown in (ii) of Fig. 3A. The collection item table defines a data item and a reference source to be collected in response to the occurrence of an event. Each record of the collection item table comprises a basket item name 351, a type (style) 352, a reference source 353 and a condition 354. The basket item name 351 is a data item name which is defined as an item constituting a basket. The type (style) 352 is the type of the corresponding data item, and it discriminates a long integer type, a short integer' type and a character type from one another. The reference source. 353 defines a source (origin) from which the data item is obtained, and it comprises a source name and a data item

name. The source name is the data name of the reference source. For example when the event is message reception, the source name indicates the content code of the message, the identifier of the processing device and the name of the data table, the identifier of the processing device and the basket name 311 of a prepared basket or the like. The data item name is the name of the data item whose value is a target to be obtained in the data indicated by the source name. In this embodiment, when the source is located in a specific processing device, the data item name is indicated by the identifier of the processing device and the data name in the processing device. However, the source may be provided with a unique name in the system to indicate the name. The condition 354 indicates a condition when the value of the indicated data item is obtained from the source indicated by the reference source 353, and it is described on the basis of the comparison between the value of the data item of the data indicated by the source name and the value of the data item received by the event indicated by the collection event 312. For example, it is described like [the data item "ID" in the source data is equal to the data item "bar code number" in the reception message] or the like.

The data structure of the table which defines the output option is shown in (iii) of Fig. 3B. This table sets an option which can be selected when the collected data are delivered to the application program. Each record of the table comprises a time out 372, a data reception/delivery method 373, an AND/OR judgment 374 and a data request side 375. The time out 372 indicates a limit time from the time when the processing device detects an event serving as a data collection condition of a basket until the time when all the data are received. The data reception/delivery method 373 indicates an event type or a demand type. In the case of the event type, data are delivered to the program immediately when the data are arranged or there is a time-

out. In the case of the demand type, the arranged data are kept stored, and when

the program requests, 

the data thus stored are delivered to the program. The AND/OR judgment 374

indicates an AND type or an OR type. In the case of the AND type, "the data are

5 arranged" means that the values of all the items constituting a basket are obtained or

that there is a time-out. In the case of the OR type, "the data are arranged" means

that the value of any item constituting a basket has been obtained, and the newest

values which have been already obtained are used for the values of the other

constituent items. The data request side 375 indicates the identifier of an application

10 program to which the data are delivered or the filtering processing 222.

The data structure of the status management table is shown in (iv) of Fig. 3B.

The status management table shows the collection status of the data item serving as

a collection target in conformity with the event identifier. Each record of the status

management table comprises an event identifier 391, a buffer index 392, a first

15 event arrival time 393 and a collection judgment map 394.

The event identifier 391 indicates the number of an event when the AND/OR judgment 374 is the AND type, and it is a number for acquiring the synchronization of data transmitted from one or plural processing devices for the event. The buffer

index 392 indicates the address of a buffer which is allocated to store items of data

20 constituting a basket for every event identifier 391. The first event arrival time 393

stores the time when the event indicated by the event identifier 391 is detected, or

the time when any basket constituting an item corresponding to the event identifier

concerned is first received. The first event arrival time 393 is checked to judge

whether a predetermined time has elapsed. By using a bit map, the collection

25 judgment map 394 indicates whether the data are obtained for every item

constituting the basket. When the value of the basket constituting item is delivered to the application program or the filtering processing 222 and the buffer is released, the record concerned is deleted. On the other hand, when the AND/OR judgment 374 is the OR type, the number of records of the status management table is equal to only one, and the buffer area indicated by the buffer index 392 is not released after the data are delivered to the program.

Fig. 4 is a diagram showing the data structure of the data access management table 231.

The data access management table 231 is a table indicating what data are managed by the self processing device and what structure is owned by the data. The data managed by the self processing device contain a message data which is transmitted/received to/from another processing device. Each entry of the data access management table 231 comprises a table name 411, a medium 412 and a data structure index 413. The table name 411 indicates the name of the data table. The medium 412 indicates whether the data indicated by the table name 411 is a message, is stored in a main memory or is stored on a disc. The data structure index 413 indicates the memory address of a table which defines the structure of the data concerned. The table defining the data structure comprises a data item 431 and a type 432. The data item 431 indicates the name of the data item constituting the data concerned. The type 432 indicates the type of the data, and it is the same as the type (style) 352.

Fig. 5 is a diagram showing the data structure of the event linking data table 232.

The event linking data table 232 is a table for setting data in the self processing device to be collected and transmitted when an event occurs. That is, this

table is a set of baskets when the data stored in the self processing device and the baskets prepared in the self processing device serve as a reference source. One line shown in the table corresponds to one record. Each record of the event linking data table 232 comprises a collection event 451, a response destination 452, a data name
5 453, a collection data item 454, a collection condition 455 and an activation status 456. The collection event 451 sets an event serving as a trigger for data collection, and has the same content as the collection event 312. The response destination 452

— indicates the identifier of a

processing device to which the values of the collected data items are transmitted.

10 For example, it indicates the identifier of a processing device to which the data renewal event of the self processing device is required to be notified. The data name 453, the collection data item 454 and the collection condition 455 have the same function as the reference source 353 and the condition 354 as show in (ii) of Fig. 3A. The activation status 456 indicates a status as to whether or not the collection and
15 transmission of data indicated by the corresponding record should be performed. The event linking data table 232 is a set of data for which the self processing device will serve as a reference source, for every collection event and every response destination.

Fig. 6A is a diagram showing the data structure of a message which the
20 communication management 223 transmits/receives between processing devices or in a processing device. The message comprises a message header 711 for communication control, and a user data portion 712 which are referred to by the application program 211, the filtering processing 222 and the data integration processing 224. The message header 711 comprises a control code 721 for
25 communication, a destination identifying code 722, a code 723 for identifying a

processing device at the transmission side, and an event identifier 724. The event identifier 724 is a serial number for time-sequentially discriminating the message which is transmitted by the processing device, and it can be expressed by the combination of the identifier of the processing device and the serial number in the processing device. Even for messages which are issued by the same program of the same processing device, the occurrence order of these messages can be discriminated. As the destination identifying code 722 it is possible to use a content code which is disclosed in Japanese Laid-open Patent Application No. Sho-56-

111353, for example. The user data

portion 712 comprises plural data items, for example, and contains the value of each data item. The processing device which receives the message refers to the data access management table 231 to obtain the type of each data item and cut out the value of each data value. Further, the communication management 223 may refer to the data access management table 231 to recognize the type of each data item, and convert the byte order of the data item value so that it can be processed in the self processing device.

Fig. 6B is a diagram showing the data structure of the user data portion 712 when data which are collected in association with the event generated by the filtering processing 222 are transmitted to the request side. The collection event type 731 is the same type as the collection event 312⁽ⁱ⁾ (i) of Fig. 3A), that is, the same type as the collection event 451 (Fig. 5). The collection event identifier 732 sets the event identifier of the event generating source. For example, when the event is message reception, the event identifier 724 of the received message is set. When the event is based on the periodic timer, the serial number, etc. are set in the self processing device. When the event is data renewal, the serial number, etc. are set in the

processing device in which the renewed data are stored. In the processing device which collects the relational data upon reception of a message notifying this data renewal as a trigger, the collection event identifier 723 attached to the renewed data is specified. The response destination 733 is an identifier of a processing device
5 which serves as a data transmission destination. The source name 734 is the data name of the reference source, and

for example, it is the identifier of the processing device, the name of the data table, etc. The collection data item list 735 sets a list of the collected data item names. The collection data 736 sets the value of each data item in correspondence ^{with} ~~with~~ the data
10 item of the collected data item list 735. The data structure shown in Fig. 6B is an example, and the data structure may be set so that plural collected data on the same event are collectively transmitted while riding together, or so that the collected data are collectively transmitted to plural response destinations.

The messages which are received by the filtering processing 222 and the data
15 integration processing 224 and are other than the message when the filtering processing 222 transmits the collected data to the response destination, are discriminated from the collection data message on the basis of the message header 711 or the content of the user data portion 712. It may be made to conform with the data format of Fig. 6B. For example, the message in which the event identifier 724
20 and the collection event identifier 732 have the same content is discriminated as a message serving as a trigger for data collection. Further, the control data or the message which is received from a specific port of the processing device can be discriminated as a specific message by the identifier of the port.

Fig. 7 is a flowchart showing the process flow of the filtering processing

25 222. The filtering processing 222 waits for occurrence of an event (step 501). In the

case of the message reception event, the communication management 223 receives the message to start the filtering processing 222. In the case of the data renewal event in the self processing device, the data access processing 221 or the data integration processing 224 starts the filtering processing 222 to deliver the renewal data. The case where the renewal data are transmitted from the data integration processing 224 means a case where a data-integrated basket is delivered to the filtering processing 222. In the case of the data renewal event of another processing device, the communication management 223 receives the message containing the renewal data to start the filtering processing 222. Further, the reception of control data transmitted from a measurement device or a sensor which is connected to the self processing device directly or through a transmission medium is also set as occurrence of an event. In the case of the periodic event, a timer interruption occurs by the periodic timer to start the filtering processing 222 (step 551). When the filtering processing 222 detects the event, the type of the occurring event and the appendant data are obtained (step 502). Subsequently, the event linking data table 232 (Fig. 5) is referenced to search whether there is data or a basket which is required to be obtained in association with the occurring event (step 503). That is, the type of the occurring event and the appendant data are checked against the collection condition of the collection event 451 to judge whether there is a record in which both are coincident. Here, the record which is set as a search target is a record in which the activation status 456 is set to an active status. As a result, if no record to be discharged (transmitted) is located (step 504:N), the processing returns to step 501. If the corresponding record is located (step 504:Y), a data item value satisfying the collection condition 455 for the data item 454 of the data indicated by the data name 453 of the record concerned is obtained (step 505). If there is no

collection condition 455, the unconditional status is set. When the data are obtained, the data access management table 231 (Fig. 4) is referred to in order to obtain the medium 412 of the corresponding data and the type 432 of the corresponding data item, and then the data access processing 221 is started to obtain the data. When
5 the data thus obtained is a basket, the basket name 311 and the basket item name 351 of the data integration management table 233 (Fig. 3A) are referenced to obtain the type 352 thereof. When there are plural data to be discharged, all the data are obtained in the same manner as described above. Subsequently, transmission data are prepared on the basis of the data thus obtained (step 506). The response
10 destination 452 of the corresponding record is stored in the response destination 733, the data name 453 thereof is stored in the source name 734, and the collection data item 454 thereof is stored in the collection data item list 735. Further, an identifier which is generated by the filtering processing 222 is stored in the event identifier 724.

15 Finally, the data are transmitted to the data integration processing 224 of the self processing device or another processing device through the communication management 223 (step 507), and the processing returns to step 501.

— Figs. 8A, 8B and 8C^{8C} are flowcharts showing the process flow of the data integration processing 224. The data integration processing 224 waits for arrival
20 of data from the self processing device or another processing device (step 601). When data or a message is received through the communication management 223 (step 602), it is judged by referring to the data integration management table 233 (Fig. 3A) whether there is any basket which requests the received data (step 603). That is, if the received message is the collection data, the source name 734 thereof
25 and the data item name of the collection data item list 735 are checked against the

reference source 353 of the data integration management table 233 to judge whether there exists any basket for which the received data is set as a basket constituting item. At this time, the type of the collection data 736 is obtained by referring to the type 352 of the basket constituting item. If there is no corresponding basket (step 5 603: N), it is judged by referring to the data integration management table 233 (Fig. 3A) whether there is any basket for which the received data is set as a collection event (step 621). That is, the collection event type 731 of the received message (and the collection data 736) is checked against the collection event 312 of the table integration management table 233 to judge whether any basket exists which satisfies 10 the collection condition. At this time, the type of the collection data 736 is obtained by referring to the type 432 of the data item 431 corresponding to the data item of the collection data item list 735 of the data name 411 which corresponds to the source name 734 of the data access management table 231 (Fig. 4). When there is a corresponding basket, the setting or renewal of the collection status shown in (ii) of 15 Fig. 8B is performed (step 622), and then the processing returns to step 601. When there is no corresponding basket, the processing immediately returns to step 601. When there is a basket requesting the received data (step 603:Y), the data item which is necessary to the basket concerned is extracted from the reception message (step 604). That is, the value of at least one data item is 20 extracted from the collection data 736. Thereafter, the collection status in the status management table shown in (ii) of Fig. 8B is set or renewed (step 605). In the search operation of the data integration management table 233 of the steps 603 and 621, the search target is limited to baskets in which the active status 316 is set to an active status. Thereafter, the data item value extracted in step 604 is stored into the 25 memory location of the data item value concerned in a buffer area which is indicated

by the buffer index 392 of the status management table ((iv) of Fig. 3B) indicated by the status management table index 315 of the basket concerned (step 606).

Next, it is judged whether the constituent items of the basket are arranged

(step 607). The collection status of the data is judged by referring to a status

management table collection judgment map 394 of the basket concerned. The

condition when the data are arranged is determined by the AND/OR judgment 374 of

the table ((iii) of Fig. 3B) which sets the output option of the basket concerned. When

the AND/OR judgment 374 is the AND type, the time when all the constituent items

are obtained corresponds to the time when the arrangement is made. When the

AND/OR judgment 374 is the OR type, the time when any one of the constituent

items is obtained corresponds to the time when the arrangement is made. The latest

data on the buffer of the constituent items which were previously obtained is used as

the other constituent items.

When it is judged that the data are arranged (step 607:Y), the processing

shifts to the processing 632 to deliver the data to the request side. If the data are not

arranged (step 607:N), the processing returns to step 601. In the processing 632, it

is judged by referring to the output option table of the basket concerned whether the

data receiving/delivering method 373 is an event type or a demand type (step 608). If

the method 373 is the event type (step 608: Y), the data are delivered to the

application program indicated by the data request side 375 of the basket concerned

or the filtering processing 222 (step 609). If the method 373 is the demand type (step

608: N), the content of the buffer area of the basket concerned which is indicated by

the buffer index 392 is stored (retracted) in the queue (step 625). The application

program can take out the data from the queue. After the processing of the steps 609

and 625, the re-setting of the collection status, that is, the arrangement of the status

management table and the buffer as shown in (iii) of Fig. 8B is performed (step 610), and the processing returns to step 601.

The flowchart showing the flow of the setting and renewal processing of the status management table is shown in (ii) of Fig. 8B. The status management
5 table of the basket concerned is searched to judge whether there is a record having the collection event identifier 732 of the received message (step 641). When the AND/OR judgment 374 of the output option table is an AND type, the output option is searched on the basis of the event identifier 391. When it is an OR type, the output
10 option table has only one record, and thus it is judged on the basis of the event identifier 391 of the record whether the record is the corresponding record. If there is no corresponding record (step 641 :N), the record is added to the table (step 642), the collection event identifier 732 of the received message is added to the event identifier 391 of the record, and the buffer area is kept to set the index thereof to the
15 buffer index 392 (step 643). The time when the event arrives is set to the first event arrival time 393 (step 644). Thereafter, the bit corresponding to the basket item thus obtained in the collection judgment map 394 is set to be already gained (step 645). If there is any corresponding record (step 641: Y), only the processing of step 645 is performed.

The flowchart showing the flow of the processing of arranging the status
20 management table and the buffer is shown in (iii) of Fig. 8B. First, it is judged whether the AND/OR judgment 374 of the output option table of the basket concerned is an AND type or not (step 651). If it is the AND type (step 651 :y), the overall item value of the basket concerned is unnecessary, and thus the buffer area indicated by the buffer index 392 of the status management table is wholly released
25 (step 652), and the content of the record having the corresponding event identifier in

the records of the status management table is cleared (step 653). If it is the RO type (step 651 :N), nothing is done.

The flowchart showing the flow of the time-out monitoring processing is shown in (iv) of Fig. 8C. When the program of this processing is periodically started (step 661), it is judged whether all the records of the basket stored in the basket setting table 301 of the data integration management table 233 are processed (step 662). If there is any non-processed basket (step 662:Y), the pointer is positioned to the records of a next basket (step 663) to judge whether all the records of the status management table of the basket concerned are processed (step 664). If there is any non-processed record (step 664:Y), the pointer is positioned to the next record of the status management table to obtain a current time (step 665), and the current time is compared with the time-out setting 372 of the basket concerned to judge whether the difference between the current time and the first event arrival time 393 has reached a predetermined value or a limit time (time-out) (step 666). When it is time-out (step 666:Y), the data reception/delivery processing 632 of Fig. 8A is executed (step 667), and the processing then returns to step 664. If the record concerned is not time-out (step 666:N), the processing returns to step 664. If all the records of the status management table are processed or the table is cleared (step 664:N), the processing returns to step 662. When the processing of all the baskets is finished (step 662:N), the time-out monitoring processing is finished. The status when the data collection has not been completed due to interruption by another processing device or the like is monitored by the time-out monitoring processing.

Fig. 9 is a diagram showing the data structure of the status control table 234. A line of the table shown in Fig. 1 corresponds to one record. An event 1611 is the same as the collection event 312 (Fig. 3A) and the collection event 451 (Fig. 5).

Start/end 1612 indicates whether the event is an event at the start of the distributed information integrating processing or an event at the end of the distributed information integrating processing. A condition frequency 1613 sets the frequency at which the event 1611 is detected to perform the start or the end indicated by the start/end 1612. An event counter 1614 represents the current detection frequency. A control target 1615 indicates whether a target under the start/end control is a basket or collection data. A control target index 1616 represents a pointer to a record for which the control target is set. If the target is the basket, it indicates the record of the basket setting table 301 (Fig. 3A). If the target is the collection data, it indicates the

record of the event linking data table.

232 (Fig. 5).

Fig. 10 is a flowchart showing the processing flow of the status control processing 225. The processing waits for reception of an event (step 1701). When the event is received, the type of the event and the appendant data are obtained (step 1702). Next, the status control table 234 (Fig. 9) is searched to judge whether there is any record which is set to be subjected to the status control in response to this event (step 1703). The search is the processing of searching for a record having an event 1611 which satisfies the type of the event and the appendant data. If there is no corresponding record (step 1703:N), the processing returns to step 1701. If there is any corresponding record (step 1703:Y), the event counter 1614 of the record concerned is incremented by 1 to renew the count value (step 1704), and the condition frequency 1613 and the renewed event counter 1614 are compared with each other (step 1705). If both are not equal to each other (the condition is not satisfied) (step 1706:N), the

processing returns to step 1703. If the condition is satisfied (step 1706:Y), the active

status 316 or the active status 456 of the record which is indicated by the control target 1615 and the control target index 1616 is renewed (step 1707). That is, if the start/end 1612 of the record of the status control table 234 which is currently being processed indicates the start, the active status 316 or the active status 456 of the record which is indicated by the control target index 1616 is set to the active status. If the start/end 1612 indicates the end, the active status 316 or the active status 456 of the record which is indicated by the control target index 1616 is set to the non-active state. Finally, the event counter 1614 of the record under processing is reset (step 1708), and the processing returns to step 1703. The start/end of the data collection can be controlled on the basis of the occurrence frequency of the event or the frequency of data collection by the status control processing 225, and the data collection control can be finely performed. For example, 'collection of data such as a device status, etc. is started in synchronization with an abnormal occurrence event, and thus this embodiment is applicable to such a case where information on a status trend under unattended operation is to be obtained.

Next, a case where distributed information is integrated by using the above-described method and construction will be described hereunder.

Fig. 11 is a diagram showing an applied case where the event is message reception. The system comprises processing devices 801, 802 and 803 which are connected to a common transmission medium. On the basis of a message 831 as a trigger event which is broadcasted through the transmission medium, the filtering processing 222 of the processing device 802 collects the data in a table data 821 stored in an external storage device (disc) 811 thereof and the filtering processing 222 of the processing device 803 collects the data in a table data 822 stored in an internal storage device (memory) thereof in order to transmit these data as

messages 841 and 842 to the processing device 801, respectively. The data integration processing 224 of the processing device 801 integrates the messages 831, 841 and 842 to prepare the data 843 constituting a basket and deliver the data to the application program 211.

5 A list of data items contained in the user data portion 712 of the message 831 is shown in ⁽ⁱ⁾ Fig. 12A. The data structure of the table data 821 owned by the processing device 802 is shown in (ii) of Fig. 1 2A. Each record comprises data items and has a part ID as a key as shown in (ii) of Fig. 1 2A. The data structure of the table data 822 stored by the processing device 803 is shown in (iii) of Fig. 1 2A, and the table data 822 comprises data items 916-919 with the lot number (Lot No.) as a key.

Fig. 12B is a diagram showing an example of the data integration management table 233 of the processing device 801 (S1). The data-integrated basket is defined by a record 921 of a basket setting table 301 and a table linked from the record 921. The basket name is "production instruction". The collection event is limited to events each having a message (Msg) in which the destination discrimination code 722 is "line access" and a condition in which the part ID is larger than 1000. The item to be collected when a message satisfying the collection condition of the collection event is received and when the collection data are received is set in records 941 to 945 of the collection item table. The item values which are defined in the records 941 and 942 are data which are obtained from the reception message serving as the collection event. The item values defined in the records 943 and 944 are the values of data items which are "condition value 1" and "condition value 2" of the table data 821 in "manufacturing condition" of the processing device 802 (S2). The "condition value 1" satisfies such a condition that

the part ID of "manufacturing condition" is equal to the part ID of the collection event message, and the "condition value 2" satisfies such a condition that the quality reference value is larger than or equal to the quality reference value of the collection event message in addition to the "condition value 1". Likewise, the item value defined
5 in the record 945 is the value of the data item "lot track record" of the table data 822 "manufacturing track record" of the processing device 803 (S3). The "lot track record" means the lot track record of records which are contained in the records of the table data 822 and in which "lot number" is equal to the lot number of the collection event message. Each basket constituent item is delivered to a program shown in the data
10 request side 375 (Fig. 3B) in the format of a long integer type or a 6-byte character type as indicated in the field of the type (style).

A setting example of the event linking data table 232 of the processing device S2 is shown in (vi) of Fig. 120. ^{12c} Records 951 and 952 are obtained by extracting
records 943 and 944 on the processing device S2 in the collection item table of the
15 data integrating management table 233, respectively. The collection condition of the collection event is the same collection condition as the collection event of the processing device S1. The response destination of the collected data is the processing device S1 of the request side. (vii) of Fig. 120 shows a setting example of the event linking data table 232 of the processing device 803 (S3). The record 961 is
20 obtained by extracting the record 945 on the processing device 53 in the collection item table of the data integration management table 233.

Fig. 13 is a diagram showing an event sequence in this embodiment, and shows the operation of the processing devices S1, S2 and S3 after the message 831 of the collection event is received. First, when the message 1001 "line access" of the
25 event identifier 1 is passed through the transmission medium, the processing device

S1 ensures a data storage area, obtains the data items "part ID" and "lot number" from the message, and then stores them into the data storage area (1011). At the same time, the processing device S2 starts to obtain the data items "condition value 1" and "condition value 2" (1021), and starts to obtain the data item "lot track record"

5 (1031). The processing device S3 finishes obtaining the data (1032), and transmits the data to the processing device S1 (1012). The processing ^{device} S1 receives the data, and stores the data into the data storing area for the event identifier 1 which is ensured in the step 1011. Subsequently, the message 1002 "line access" of the event identifier 2 is passed (1002), and the processing device S1 receiving the

10 message newly ensures the data

Storage area for the event identifier 2 although the collection processing on the event

identifier 1 is not finished (1013).

The processing device S2, S3 start to obtain data with a message 1002
15 as a trigger (1022, 1033). Subsequently, the processing device S3 finishes the data obtaining processing in association with the event identifier 1 (1023), and transmits the data to the processing device S1. The processing device S1 receives the data (1014). If the AND/OR judgment 374 is specified as the AND type, it judges that the data are arranged, and the data are delivered to the application program 211
20 (1017). Subsequently, in the same manner as described above, the processing device S1 receives the data ⁽¹⁰³⁴⁾ [f.034] obtained by the processing device S3, stores the data into the ensured data storage area (1015), receives and stores the data (1024) obtained by the processing device S2 (1016), and delivers the data to the application program 211 (1018). When the application program 211 is set to receive the data in

25 the OR type, the

value of the latest data item received is delivered to the application program 211 at all the time points 1011 to 1016.

As described above, according to this embodiment, the application program 211 can obtain data which are distributively stored in the processing devices S2, S3 at the time the message 831 occurs. The application program 211 can obtain only the values of necessary data items without considering the processing device in which the data are stored and the data structure of the data. Further, only the data which are interlocked with the occurrence of the message 831 are delivered, and thus it is not necessary for all data containing necessary and unnecessary data to be obtained and for the necessary data to be selectively extracted by judging the contents of all the data. Further, even when the data structure of the data tables 821 and 822 is altered, it is sufficient to merely alter the set value of the table in association with the table access management table 231 and the data integration management table 233, and it is unnecessary to review the source code of the application program 211.

Fig. 14 is a diagram showing an applied case where the data renewal is an event.

The system comprises processing devices 1101 (S1), 1102 (S3) and 1104 (S4) which are connected to a common transmission medium. In response to the renewal of the data table 1111 as a trigger event, the filtering processing 222 of the processing device S3 refers to the event linking data table 232 to transmit the data of the data table 1111 as a message 1121 to the other processing devices S1 and S4. The filtering processing 222 of the processing device S4 receives the message as a data renewing event of the other processing devices, and refers to the event linking data table 232 to collect the relational data from the data table 1112 and

transmit a message 1122 to the processing device S1 serving as the response destination.

The data integration processing 224 of the processing device 51 refers to the data integration management table 233 to integrate the received data, and delivers
5 the integrated data to the application program 211. As described above, the relational data can be transmitted to the processing device S1 with the renewal event of the data table 1111 as a trigger. Therefore, the program which renews the data table 1111 is not required to transmit the renewal event to the processing device S1, and also, the application program 211 of the processing device S1 is not required to
10 monitor the renewal of the data table 1111 and may merely wait for arrival of necessary data, so that it can be devoted to the processing which uses the arriving data.

Fig. 15A is a diagram showing a setting example of the data integration management table 233 of the processing device S1. The data-integrated basket
15 is defined by the record 1211 of the basket setting table 301 and the table linked therefrom. The basket name is "advancement". The collection event is the renewal of the data item "lot track record" in the data table 1111 "manufacturing track record" of the processing device S3. The items to be collected when the collection event and the collection data are received are set in records 1231 to 1233 of the collection item
20 table. The item values defined in the records 1231 and 1232 are data which are obtained from the data items "lot number" and "lot track record" in the data table 1111 "manufacturing track record" of the processing device S3 respectively, and these item values are contained in the message 1121. The item value defined in the record 1233 is the value of the data item "planned quantity" of the data table 1112
25 "manufacturing plan" of the processing device S4.

Fig. 15B is a diagram showing a setting example of the event linking data table 232 of the processing device S3. The records 1241 and 1242 are obtained by extracting the records 1231 and 1232 on the processing device S3 in the collection item table of the data integration management table 233 respectively. The response destination of the collected data are the processing devices S1 and S4 at the request side. Fig. 150 is a diagram showing a setting example of the event linking data table 232 of the processing device S4. The record 1251 is likewise obtained by extracting the record 1233 on the processing device S4 in the collection item table of the data integration management table 233.

The above embodiments are directed to the applied case where the message is set as an event and the case where the data renewal is set as an event. In the case of the periodic event, the data collection is performed in the same manner. The event linking data table 232 and the data integration management table 233 are set as described above, and data and message data which are stored into plural processing devices can be collected in a composite manner. By setting these tables, the application program 211 is allowed to receive the data. Therefore, it is unnecessary to take the medium or the processing device into account, collect the data while sequentially inquiring about the data and review the programs due to alteration of the data structure of the messages and the data tables, so that the labor required for developments can be greatly reduced. Further, the data are not collected after the event is detected, but upon occurrence of an event the plural processing device sides cooperate with one another to transmit the indicated data, so that the data can be obtained on a real-time basis, and the processing performance can also be enhanced.

Fig. 16 is a diagram showing an applied case where the data integration

processing is used in multiple stages. This is the case where the application program 211 on the processing device ¹³⁰¹1301(S1) collects the data of the processing devices 1302 (S2) to 1308 (S8). The data on the data table 1314 of the processing device S4 1304 and the data on the data table 1313 of the processing device S3 are

5 transmitted to the processing device S2 1302 on the basis of the messages 1321, 1322 respectively, the value of the data item is also obtained from the data table 1312 of the processing device S2, and these data are integrated by the data integration processing 224 of the processing device S2. Reference numeral 1341 represents the basket obtained by integrating the collected data. The basket 1341 is

10 transmitted to the filtering processing 222 of the processing device S2, and transmitted as a message 1325 to the processing device S1 which requests this basket. Further, the data on the data table 1317 of the processing device S7 and the data on the data table 1318 of the processing device S8 are periodically transferred to the data table 1316 of the processing device S6 1306 by a transfer memory 1326.

15 The data are transmitted as a message 1328 through the filtering processing 222 of the processing device S6 1306 to the processing device S1, and collected as a basket 1342. The processing device S1 integrates the basket 1341 obtained from the processing device S2 on the basis of the message 1325 and the basket 1342 to prepare a basket 1343, and delivers the basket 1343 to the application program 211.

20 The basket 1343 is prepared on the basis of the baskets 1341 and 1342, and the basket is used in multiple stages inside/outside the processing device. The data of the processing devices S3, S4 and S7, S8 to which the transmission medium is not directly linked may be directly obtained from the processing device S1 if the communication can be performed. However, by using the construction of the above

25 embodiment, the baskets 1341 and 1342 may be collected on the basis of different

events to integrate the data as a single basket on the basis of the basket 1343.

Further, the information of the processing devices S2 to S4 is collected as a gateway by the processing device S2, thereby localizing the setting of the table integration management table 233 of the processing device S1.

5 Fig. 17A is a diagram showing a setting example of the data integration management table 233 held by the processing device S1. A record 1411 defines the basket 1343. No collection event is set in this record 1411. That is, as the constituent items, the basket only receives data transmitted from the self processing device or another processing device. The constituent item of the basket 1343 is
10 defined by the records 1421 and 1422 of the collection item table. That is, the basket 1343 is an integration of the basket 1341 "N2 status" and the basket 1342 "N3 status". The source of the basket "N2 status" is a basket having the name "status basket" of the processing device S2, and the source of the basket "N3 status" is a basket "Net3 status" of the self processing device. The record 1412 defines the
15 basket 1342, that is, the basket "Net3 status". The basket "Net3 status" comprises data to be collected when the data, table 1316 which is called "status table" of the processing device S6 is renewed. The
constituent item of the basket "Net3 status" is defined by the record 1431 of the collection item table. That is, it is all the items, of the "status table" of the processing
20 device S6. The type of the constituent item in the records 1421, 1422 and 1431 indicates "structure" which is an assembly of plural data items.

Fig. 17B is a diagram showing a setting example of the event linking data is table 232 which is held by the processing device S2. A record 1441 is set to transmit all the data items to the processing device S1 when the basket 1341 which is named
25 "status basket of the self processing device is renewed. Here, "status basket is the

basket 1341 obtained by integrating data which are collected on the basis of an event such as period, renewal or the like from the processing devices S2, S3 and S4, and the details of the constituent item are defined by the data integration management table 233 which is held by the processing device S2.

5 Some data collection modes and the applied cases where the processing device integrating the collected data immediately delivers baskets to the application program are described above. Fig. 18 is a diagram showing the system construction when the collected and integrated data are delivered at the time the program requests. A processing device 1501 collects and integrates data from a processing
10 device 1502 and a processing device 1503. The integrated data are used by the application program 211 of the processing device 1504 or the application program 211 of a processing device 1505. Here, the processing device 1501 and the processing device 1504 are connected to transmission media respectively, and the transmission media 1511, 1512 are linked to each other through a processing device
15 serving as a gate way or WAN. The processing device 1505 is linked to the transmission medium 1513 through a communication device 1522, and the
 processing device 1501 is linked to the
 transmission medium 1513 through the communication device 1521. This is applied to such cases where the transmission medium 1513 is a public telephone line, the
20 communication devices 1521, 1522 are modems, the transmission medium 1513 is a radio LAN, the communication devices 1521, 1522 are radio LAN interfaces, etc. The processing device 1505 is a portable information terminal or the like. In this case, there is a case where the data integrated in the processing device 1501 cannot be immediately transmitted or a case where it is required that the data are not
25 immediately received for some reason and the results which are afterwards collected

as a single of unit are received. In such a case, the data are collected from the processing devices ↑

1502 and 1503 on the basis of the messages 1541 and 1542 as described above and integrated, thereby retracting the integrated data as data 1544 from the buffer.

5 At this time, the data integration management table 233 of the processing device 1501 indicates the demand type as the data reception/delivery method 373 of the collected basket. The retracted data are transmitted 1545 to the processing device 1504 at the convenience of the processing device 1504 or are transmitted 1546 to the processing device 1505 at the convenience of the processing device 1505, and
10 used by the respective application programs 211 thereof.

As described above, according to the present invention, the data which are required by the application program are arranged and supplied to the application program when the application program needs the data. Therefore, the application is not required to be provided with code for inquiring about the data collection, and thus
15 the development of programs can be facilitated. Further, it is unnecessary to correct the application program even when the storage medium and the data structure of the data source, the processing device storing the data and the transmission medium used for the data collection are renewed.

Further, the control is performed on the basis of the occurrence of an event
20 which indicates the start or the end of the data collection, so that the data collection timing can be controlled more finely.